National Library of Canada
Bibliothèque nationale du Canada

Canadian Theses Service
Service des thèses canadiennes

Ottawa, Canada
K1A 0N4

NOTICE

The quality of this microform is heavily dependent upon the quality of the original thesis submitted for microfilming. Every effort has been made to ensure the highest quality of reproduction possible.

If pages are missing, contact the university which granted the degree.

Some pages may have indistinct print especially if the original pages were typed with a poor typewriter ribbon or if the university sent us an inferior photocopy.

Previously copyrighted materials (journal articles, published tests, etc.) are not filmed.

Reproduction in full or in part of this microform is governed by the Canadian Copyright Act, R.S.C. 1970, c. C-30.

AVIS

La qualité de cette microforme dépend grandement de la qualité de la thèse soumise au microfilmage. Nous avons tout fait pour assurer une qualité supérieure de reproduction.

S'il manque des pages, veuillez communiquer avec l'université qui a conféré le grade.

La qualité d'impression de certaines pages peut laisser à désirer, surtout si les pages originales ont été dactylographiées à l'aide d'un ruban usé ou si l'université nous a fait parvenir une photocopie de qualité inférieure.

Les documents qui font déjà l'objet d'un droit d'auteur (articles de revue, tests publiés, etc.) ne sont pas microfilmés.

La reproduction, même partielle, de cette microforme est soumise à la Loi canadienne sur le droit d'auteur, SRC 1970, c. C-30.

NL-339 (r. 88/04)

Canada

THE UNIVERSITY OF ALBERTA

DIAGNOSTIC-SPECIFIC ACUTE CARE HOSPITAL UTILIZATION BY ELDERLY IN ALBERTA

by

ANNE-MARIE HASIUK

(C)

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF HEALTH SERVICES ADMINISTRATION

DEPARTMENT OF HEALTH SERVICES ADMINISTRATION AND COMMUNITY MEDICINE

EDMONTON, ALBERTA

FALL 1987

Permission has been granted to the National Library of Canada to microfilm this thesis and to lend or sell copies of the film.

The author (copyright owner) has reserved other publication rights, and neither the thesis nor extensive extracts from it may be printed or otherwise reproduced without his/her written permission.

L'autorisation a été accordée à la Bibliothèque nationale du Canada de microfilmer cette thèse et de prêter ou de vendre des exemplaires du film.

L'auteur (titulaire du droit d'auteur) se réserve les autres droits de publication; ni la thèse ni de longs extraits de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation écrite.

ISBN 0-315-40994-0

THE UNIVERSITY OF ALBERTA

RELEASE FORM

NAME OF AUTHOR ANNE-MARIE HASIUK

TITLE OF THESIS DIAGNOSTIC-SPECIFIC ACUTE CARE HOSPITAL UTILIZATION BY ELDERLY IN ALBERTA

DEGREE FOR WHICH THESIS WAS PRESENTED MASTER OF HEALTH SERVICES ADMINISTRATION

YEAR THIS DEGREE GRANTED FALL 1987

Permission is hereby granted to THE UNIVERSITY OF ALBERTA LIBRARY to reproduce single copies of this thesis and to lend or sell such copies for private, scholarly or scientific research purposes only.

The author reserves other publication rights, and neither the thesis nor extensive extracts from it may be printed or otherwise reproduced without the author's written permission.

(SIGNED) Anne-Marie Hasiuk

PERMANENT ADDRESS:
135 ROMFIELD CIRCUIT
THORNHILL, ONTARIO
L3T 3H7

DATED OCTOBER 7, 1987

THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled DIAGNOSTIC-SPECIFIC ACUTE CARE HOSPITAL UTILIZATION BY ELDERLY IN ALBERTA submitted by ANNE-MARIE HASIUK in partial fulfilment of the requirements for the degree of MASTER OF HEALTH SERVICES ADMINISTRATION.

Kyung Bg

Supervisor

L Young

Janet A. Kerr

Date Oct. 2, 1987

DEDICATION

To BaBa,

what will be will be.

ABSTRACT

The provision of health services to the elderly, particularly within the acute care hospital sector, presents a major challenge to health service planning and policy development endeavors. This study was undertaken to investigate diagnostic-specific aspects of acute care hospital utilization by the elderly.

An exploratory and descriptive research strategy was applied, utilizing retrospective data in a cross-sectional design. Employing the Professional Activity Study data and a diagnostic emphasis, the data analysis strategies undertaken included: (1) an assessment of overall provincial utilization patterns and rates; (2) examination of elderly discharge patterns; (3) development of diagnostic indices; and (4) investigation of diagnostic multiplicity relative to elderly resource consumption.

The major findings of this study indicated:

1. Eight major primary diagnostic categories accounted for more than 80 percent of all elderly separations and patient-days.
2. More than one third of all elderly patient-days resulted in alternative discharges. Among these discharges specific patterns of utilization were demonstrated across diagnostic categories, hospital types and patient origins.
3. In total, the diagnostic and non-diagnostic variables studied explained 16.2 percent of the variation in

elderly lengths of stay (LOSs). At an exploratory level, it was found that diagnostic-specific combinations could be used to predict elderly LOSs in hospital.

4. Regression analyses indicated that advancing age, gender, tertiary hospital types, metro district patient origins, institutional discharges, and accident related diagnoses were associated with increased LOSs. Multiple diagnoses, operative procedures and secondary diagnoses contributed, in that order, to a change in LOS.

Subsequent to these findings, it was concluded that: (1) elderly utilization tended to centre on one body system such that additional diagnoses and operative procedures most often involved the body system of the prime diagnosis; (2) health system factors and diagnostic-specific differences are reflected in discharge patterns and have implications for post-acute care service requirements; (3) a broad range of diagnostic and non-diagnostic variables influence hospital utilization; and (4) diagnostic multiplicity can be utilized to predict hospital resource consumption.

Recommendations for further research and health care planning strategies were offered.

ACKNOWLEDGEMENTS

I wish to extend my deepest gratitude to Dr. Kyung Bay, my thesis supervisor, who provided direction and guidance throughout this thesis. His patience and encouragement were a great support. Sincere appreciation is also extended to Dr. Janet Kerr and Professor Lory Laing, members of my thesis committee.

To my family, I am truly indebted. Their love and encouragement nurtured the strength and determination required to undertake and complete this work.

And finally, very special thanks are due to my beloved husband. He believed when I doubted.

Table of Contents

Chapter — Page

DEDICATION iv

ABSTRACT v

ACKNOWLEDGEMENTS vii

LIST OF TABLES xii

LIST OF FIGURES xvii

1. INTRODUCTION 1

1.1 Statement of the Problem 1

1.2 Study Objectives 3

1.3 Significance of the Study 4

1.4 Scope, Assumptions and Limitations of the Study ..6

1.5 Definition of Terms 9

1.6 Thesis Format 11

2. LITERATURE REVIEW 12

2.1 Models of Utilization and Theoretical Concepts ..12

2.1.1 Utilization Models 12

2.1.2 The Systems Perspective 15

2.1.3 The Concepts of Need, Demand and Utilization 17

2.1.4 Theoretical Concepts 20

2.1.5 Summary 21

2.2 Determinants of Utilization 21

2.2.1 Demographic Determinants 22

2.2.2 Social-Psychological Determinants 22

2.2.3 Regional Determinants 23

2.2.4 Clinical and Economic Determinants 25

2.2.5 Summary 26

2.3 Utilization of Health Services by the Elderly ...27

2.3.1 The Impact of Technology 28
2.3.2 Biophysiological Aspects of Aging 29
2.3.3 Resource Utilization by the Elderly 33
2.3.4 Bed Blocking 43
2.3.5 Summary 46
2.4 Classification Systems 46
2.4.1 Disease Classification 47
2.4.2 Patient Classification 52
2.4.3 Case-Mix Measures 55
2.4.4 Summary 63
2.5 Discharge Status 64
2.5.1 Determinants of Discharge Status 64
2.5.2 Discharge Destination 68
2.5.3 Summary 73
2.6 Summary of the Literature Review 73
3. METHODOLOGY 76
3.1 Conceptual Framework and Research Strategy 76
3.1.1 Conceptual Framework 76
3.1.2 Research Strategy 80
3.2 Data Sources 83
3.2.1 Professional Activity Study (PAS) Data 83
3.2.2 Census Data 91
3.3 Data Analysis Strategies 92
3.3.1 Provincial Analysis 92
3.3.2 Discharge Destination Analysis 93
3.3.3 Development of Diagnostic Index 94
3.3.4 Regression Analyses 96

3.4 Methodological Summary 98

4. RESULTS 100

4.1 Provincial Profile 100

4.1.1 The Hospital System In Alberta 100

4.1.2 Population Description 104

4.2 Provincial Utilization By The Elderly 106

4.2.1 Age and Gender 108

4.2.2 Hospital Type and Patient Origin Analysis 111

4.2.3 Diagnostic-Specific Analysis 113

4.2.4 Summary of Findings 124

4.3 Elderly Discharge Status 127

4.3.1 Age Related Differences In Discharge Status 129

4.3.2 Accident Related Discharge Status 134

4.3.3 Discharge Status According to Hospital Type and Patient Origin 136

4.3.4 Diagnostic Patterns of Discharge 141

4.3.5 Summary of Findings 145

4.4 Diagnostic Indices 147

4.5 Multiple Regression Analyses 149

4.5.1 Specification A: Diagnostic Variables 152

4.5.2 Specification B: Non-Diagnostic Variables 153

4.5.3 Specification C: Diagnostic and Non-Diagnostic Variables 153

4.5.4 Summary of Findings 158

5. SUMMARY AND RECOMMENDATIONS 160

5.1 Summary of the Study 160

5.2 Major Findings 162

5.3 Conclusions 167

5.4 Recommendations 169
SELECTED REFERENCES 171
APPENDIX A 182
APPENDIX B 191
APPENDIX C 200
APPENDIX D 209

List of Tables

Tables		Page
1	Diagnostic and Operative Categories.....	87
2	Index Variables for Regression Analysis..	97
3	Supply of Acute Care, Long-Term Care, and Nursing Home Bed Supply in Alberta: 1979 - 1984.....	103
4	Population of Alberta and Canada in 1981.	105
4A	Distribution of Elderly by Age and Sex, Alberta and Canada 1981.....	105
5	Utilization of Hospital Services According to Age and Sex.....	107
6	Elderly Utilization of Hospital Services According to Age and Sex.....	109
7	Hospital Utilization According to Patient Origin and Hospital Type.....	112
8	Leading Primary Diagnoses.....	115
9	Hospital Utilization Broken Down by Discharge Status.....	128
10	Hospital Utilization Broken down by Discharge Status and Age Groupings.....	131
11	Acute Care Hospital Utilization Preceeding Institutionalization.....	133
12	Discharge Status Associated With Accidents Among the Elderly.....	135

13	Elderly Discharge Status Broken Down by Hospital Type.....	137
14	Elderly Discharge Status Broken Down by Patient Origin.....	140
15	Discharge Status Broken Down by Leading Primary Diagnoses.....	143
16	Regression Analyses Summary.....	151
A.1	Secondary Diagnoses Associated With Primary Circulatory Diagnoses.....	183
A.2	Secondary Diagnoses Associated With Primary Digestive Diagnoses.....	184
A.3	Secondary Diagnoses Associated With Primary Respiratory Diagnoses.....	185
A.4	Secondary Diagnoses Associated With Primary Diagnoses of Neoplasms.....	186
A.5	Secondary Diagnoses Associated With Primary Diagnoses of Injury and Poisonings.....	187
A.6	Secondary Diagnoses Associated With Primary Genitourinary Diagnoses.....	188
A.7	Secondary Diagnoses Associated With Primary Diagnoses of the Nervous and Sense Organs.....	189
A.8	Secondary Diagnoses Associated With Primary Musculoskeletal Diagnoses.....	190
B.1	Primary Surgical Procedures Associated With Primary Circulatory Diagnoses.....	192

B.2	Primary Surgical Procedures Associated With Primary Digestive Diagnoses.....	193
B.3	Primary Surgical Procedures Associated With Primary Respiratory Diagnoses.....	194
B.4	Primary Surgical Procedures Associated With Primary Diagnoses of Neoplasms.....	195
B.5	Primary Surgical Procedures Associated With Primary Diagnoses of Injury and Poisonings.....	196
B.6	Primary Surgical Procedures Associated With Primary Genitourinary Diagnoses.....	197
B.7	Primary Surgical Procedures Associated With Primary Diagnoses of the Nervous and Sense Organs.....	198
B.8	Primary Surgical Procedures Associated With Primary Musculoskeletal Diagnoses...	199
C.1	Diagnostic Complexity Measures for Primary Circulatory Diagnoses Combined With Secondary Diagnoses.....	201
C.2	Diagnostic Complexity Measures for Primary Digestive Diagnoses Combined With Secondary Diagnoses.....	202
C.3	Diagnostic Complexity Measures for Primary Respiratory Diagnoses Combined With Secondary Diagnoses.....	203
C.4	Diagnostic Complexity Measures for Primary Diagnoses of Neoplasms Combined With Secondary Diagnoses.....	204

C.5 Diagnostic Complexity Measures for Primary Diagnoses of Injury and Poisonings Combined With Secondary Diagnoses..... 205

C.6 Diagnostic Complexity Measures for Primary Genitourinary Diagnoses Combined With Secondary Diagnoses..... 206

C.7 Diagnostic Complexity Measures for Primary Diagnoses of the Nervous and Sense Organs Combined With Secondary Diagnoses..... 207

C.8 Diagnostic Complexity Measures for Primary Musculoskeletal Diagnoses Combined With Secondary Diagnoses..... 208

D.1 Diagnostic Complexity Measures for Primary Circulatory Diagnoses Combined With Primary Surgeries..... 210

D.2 Diagnostic Complexity Measures for Primary Digestive Diagnoses Combined With Primary Surgeries..... 211

D.3 Diagnostic Complexity Measures for Primary Respiratory Diagnoses Combined With Primary Surgeries..... 212

D.4 Diagnostic Complexity Measures for Primary Diagnoses of Neoplasms Combined With Primary Surgeries..... 213

D.5 Diagnostic Complexity Measures for Primary Diagnoses of Injury and Poisonings Combined With Primary Surgeries..... 214

D.6 Diagnostic Complexity Measures for Primary Genitourinary Diagnoses Combined With Primary Surgeries..... 215

D.7 Diagnostic Complexity Measures for Primary Diagnoses of the Nervous and Sense Organs Combined With Primary Surgeries..... 216

D.8 Diagnostic Complexity Measures for Primary Musculoskeletal Diagnoses Combined With Primary Surgeries..... 217

LIST OF FIGURES

Figure		Page
1	Conceptual Framework.....	78
2	Alberta's Hospital Districts.....	90

Chapter 1

INTRODUCTION

Although population projections vary according to the underlying assumptions used, the aging trend of the Canadian population is clear. The impact of the changing age structure in combination with current health resource constraints has directed the attention of policy makers, planners and administrators to the aging population and the provision of care. Particular interest and concern is centered on the elderly's use of acute care hospitals, which is one of the most costly components of the health care delivery system. In response to such concerns, an examination of selected aspects of acute care hospital utilization by the elderly in Alberta during the 1983-84 fiscal year was undertaken.

1.1 Statement of the Problem

The provision of health care services to the elderly is emerging as a major challenge to health service planners and policy makers. Increasing emphasis on cost containment in the health care delivery system, coupled with the substantial contribution of the hospital sector to health care costs, has provided the impetus for policy makers, planners, administrators and researchers to examine and evaluate patterns of acute care hospital utilization by the elderly. One area of particular concern is the elderly's disproportionate utilization of acute care services. Accordingly, the utilization of acute care hospital services

by the elderly is of vital importance to future health care planning efforts.

Although the elderly in Canada represent approximately 10 percent of the population, they utilize more than one third of the total hospital bed capacity. This disproportionate consumption of health resources is attributed to varying health needs, patterns and characteristics of the elderly as well as structural characteristics of the health care delivery system. Those persons aged sixty-five years and older present the health care system in general and the acute care component specifically with unique demands for health services.

The increased prevalence of chronic disease and disability, in addition to the natural aging process, contribute to the frailty and vulnerability of the elderly patient population, mandating a "caring" rather than "curative" approach to health care. The orientation of the current acute care hospital system, however, is based upon curative approaches which emphasize 'high tech' means of health care delivery. By requiring ongoing and caring approaches, the health service needs of the elderly place additional demands upon acute care hospital resources. Thus, predictions of an increase in the proportion of elderly patients and the resultant expectation of a heightened demand upon health care resources render the elderly's disproportionate consumption of health resources of paramount concern.

From a system's perspective, numerous factors, internal and external to the acute care hospital component of the health care system, contribute to the growing presence of the chronic long-stay elderly patient population. Indeed, the *"back-up"* or *"bed-blocking"* of geriatric patients in acute care hospitals is generally indicative of the rising concern with respect to the appropriate use of hospital beds. Furthermore, the extensive impact of the long-stay elderly patient in an acute care facility gives rise to several issues concerning bed utilization, quality of care, professional practice and hospital finance.

In view of the complexity of the foregoing problem and the inextricable nature of its components, an investigation of selected aspects of acute care hospital utilization by the elderly is deemed critical to understanding the health resource consumption of this patient population. Further, enhanced knowledge and understanding of health resource consumption is of significant value in facilitating health care planning and policy formulation. To that end, this cross-sectional, exploratory, population-based study was undertaken to analyze selected aspects of acute care hospital utilization, during 1983-84, by the elderly in the province of Alberta.

1.2 Study Objectives

The primary purpose of this study was to identify patterns of acute care hospital utilization by the elderly in Alberta, with particular emphasis on patterns of use

relative to major diagnostic categories. Consequently, the following specific research objectives were formulated:

1. To estimate, from a cross-sectional perspective, the volume and general patterns of acute care hospital utilization by the elderly in Alberta with particular regard to major diagnostic categories, thereby describing diagnostic-specific patterns of utilization;
2. To identify the association between acute care hospital utilization by the elderly and discharge status; and
3. To explore the relationship between diagnostic multiplicity and resource consumption as measured by length of stay, thereby developing an index of multiple diagnoses relative to the resource consumption by the elderly.

1.3 Significance of the Study

The aging of the population and the concomitant demands placed on the health care system render the study of elderly acute care hospital utilization timely and of critical import. The current research investigates the patient profile through a number of patient variables including discharge status and diagnoses. Employing a diagnostic-specific approach, this research attempted to enhance understanding of resource consumption by the geriatric population which typically exhibits multiple diagnoses and distinct patterns of utilization. As such, the general significance of the study stems from its

contribution to an increased understanding of elderly utilization of hospital services. Further, this utilization information highlights particular resource requirements and thus directs health care planning strategies.

Methodologically, the significance of the study stems from an attempt to develop an index of multiple diagnoses which measures elderly resource consumption. In measuring the diagnostic mix of patients, this study facilitates the prediction of resource consumption while providing a relative standard of expected utilization. In view of the rising cost of health care and current interest in volume-driven and diagnoses-related funding, the diagnostic emphasis employed in this research is of considerable interest.

Overall, the significance of this research relates to a recognition of the pending growth of the geriatric population in an acute care hospital system which emphasizes acute and curative intervention. Such a system is thus generally ill-prepared for the often long-term and chronic demands of the elderly. The cross-sectional and exploratory nature of the study utilizing the most current available data facilitated the investigation of multiple diagnoses and resource consumption by the elderly. The scope of the study encompassed all elderly separations from acute care hospitals in Alberta during one year, providing information concerning the elderly patient population and patterns of utilization for health care planning and policy making.

1.4 Scope, Assumptions and Limitations of the Study

The scope of the study entailed a cross-sectional design with a descriptive, population-based and exploratory analysis of acute care hospital bed utilization by the elderly in Alberta. The study was restricted to Alberta acute care hospital separations generated from April 1, 1983 to March 31, 1984 by those patients aged sixty-five years and older on admission.

The research objectives and design were based upon the following assumptions:

1. In keeping with the purpose of the current study, Alberta is conceptually considered as having a closed acute care hospital system. Thus, acute care hospital utilization by non-residents of Alberta and utilization of out-of-province acute care hospitals by Alberta residents were excluded from the data. Consequently, the data analysis was restricted to acute care hospital utilization in Alberta by Alberta residents only. Although, a slight underestimation of acute care hospital utilization in Alberta was expected in terms of population-based rates; it was considered insignificant in relation to the study results.
2. Given the typically complex case mix of the geriatric patient population, relative to the high incidence of multiple diagnoses and the prevalence of chronic diseases, the principal and secondary diagnoses, and the primary operative procedures taken from the separation abstracts were assumed to be the most accurate

diagnostic information. It was further assumed that the true diagnoses were known and coded.

3. Census data represent a cross-sectional demographic observation at one point in time, while the Professional Activity Study (PAS) data represent continuous observations over a period of time. While recognizing this apparent incongruency, the 1983-84 utilization rates were tabulated using the 1981 census data. Although some inaccuracy was expected, it was believed to be minimal based on the following factors. Firstly, the overall economic conditions in Alberta since 1981 are thought to have resulted in either the decline or stability of the population. Secondly, the elderly are generally assumed to be a non-transient population.
4. The use of an external data source, the Commission on Professional and Hospital Activities (CPHA), forfeited the researcher's ability to control data quality. Reasonable accuracy, validity and reliability were assumed through the quality checks employed by the CPHA. Coding errors, if any, were assumed to be random, to be of a cancelling nature at the aggregate level, and to be without systematic bias.
5. Utilization data, by its very nature, measures actual utilization of health services and does not account for the appropriateness of service use. Utilization data therefore, reflects only health care demands which have been served, and does not provide any direct measure of needs or demands which remain unserved. It must be

assumed, that in aggregate, the utilization rates reflected in the data approximate the true needs of the geriatric patient population. This is admittedly optimistic considering the notable proportion of long-stay geriatric patients in acute care hospitals waiting placement in other facilities. Nevertheless, in view of current resource constraints, the research served to identify geriatric resource consumption and in doing so, justified more rational resource allocation.

A number of data and methodologic limitations are apparent:

1. The unit of PAS data is hospital separations rather than discrete patients or episodes of illness. Given the high proportion of multiple admissions in a geriatric population, the volume of separations will not coincide with the volume of geriatric patients served. Hence, the unit of analysis, the separation, is limited by the source of the data. In order to compensate for this data limitation, patient-days were employed as a measure of hospital utilization in addition to separation measures.
2. The employment of a cross-sectional design utilizing historical data in a retrospective study limits the application of study findings. Cautious interpretation must be presented in view of the limited predictive applicability of the research results.
3. The data are limited by potential physician bias toward recording related diagnoses on the discharge abstract. The possibility then exists that only related diagnoses

are coded on the abstract despite the presence of additional diagnoses in other diagnostic categories.

4. While utilization data represent actual resources consumed, it does not represent true need. The data are thus limited by the impact of iatrogenic disease, which may prolong hospital utilization, and the availability of alternative modes of service delivery, which might reduce or augment hospital utilization, as well as a plethora of other psycho-social, economic, geographic and cultural factors which are beyond the scope of this study.
5. A further data limitation results from the fact that some acute care hospitals have auxiliary hospital components which are also reflected in the PAS data file. Such auxiliary type separations are believed to be small in number and will be controlled by excluding auxiliary type long-stay cases, those stays in excess of 120 days, from the analysis.

1.5 Definition of Terms

The following definitions are in keeping with the current study:

(ACUTE CARE) GENERAL HOSPITAL - "a hospital which provides primarily for the diagnosis and short-term treatment of patients for a wide range of diseases or injuries" (Alberta Hospitals and Medical Care Annual Report, 1981-1982).

AVERAGE LENGTH OF STAY - "the average number of days stay of

in-patients who were separated from the facility during the reporting year. It is calculated by dividing the total days stay by the number of separations during the reporting year" (Alberta Hospitals and Medical Care Annual Report, 1981-1982).

ELDERLY (GERIATRIC POPULATION) - those sixty-five years of age and older on admission.

PATIENT-DAYS (PDAYS) "The total volume of in-patient care, expressed in patient-days, of the facility during the reporting year" (Alberta Hospitals and Medical Care Annual Report, 1981-1982).

PATIENT ORIGIN - refers to the hospital district within which the patient's residence is located.

PRIMARY (PRINCIPAL) DIAGNOSIS - the diagnosis which is regarded as the primary reason for the patient's admission to hospital.

PRIMARY SURGICAL (OPERATIVE) PROCEDURE - refers to the procedure which is associated with the primary diagnosis.

SECONDARY DIAGNOSIS - the most acute diagnosis which is of secondary importance to the patient's hospitalization.

SEPARATION - "the discharge or death of an in-patient" (Alberta Hospitals and Medical Care Annual Report, 1981-1982).

1.6 Thesis Format

This thesis is divided into five chapters and four appendices. Chapter 1 introduces the purpose, scope and significance of the study. A selective review of the current literature is presented in Chapter 2, providing the background information for the methodology contained in Chapter 3. Chapter 4 consists of a discussion of the data analysis. Research findings, conclusions and recommendations are summarized in Chapter 5. Appendices A, B, C and D contain supplementary tables relevant to Chapter 4.

Chapter 2

LITERATURE REVIEW

A selective review of the literature pertaining to the present research focused upon: 1) models of health service utilization and theoretical concepts; 2) determinants of hospital utilization; 3) acute care hospital utilization by the elderly; 4) classification systems; and 5) discharge status.

2.1 Models of Utilization and Theoretical Concepts

Models of utilization can direct data collection and analysis by facilitating the delineation of interrelationships among variables (Andersen & Anderson, 1979). In doing so these models are intended to heighten understanding of the patterns and trends of health service utilization. It appears that the major distinction among various utilization models is the set of independent variables used as determinants of health services utilization. Of the numerous models and theoretical concepts described in the literature, only the most germane to the present research will be discussed.

2.1.1 Utilization Models

The sociodemographic model of health service utilization has provided the basis of many utilization studies (Andersen & Anderson, 1979; Anderson, 1973). According to this model, variations in utilization are related to sociodemographic variables such as age, gender

and family size which are associated with levels of health service utilization as well as education, socioeconomic status and ethnicity which reflect associated behaviors leading to health service utilization. These variables are said to account for a significant portion of the variation in utilization behavior, presumably due to their effects on:

> intervening variables such as need, recognition of and response to symptoms, knowledge and perceived threat of disease, and finally the motivation to get well and choice of health services (Anderson, 1973, p. 196).

Alternatively, the economic model emphasizes the principles of supply and demand. Factors which affect an individual's demand for services, such as health insurance coverage, and factors which affect the supply of services, such as the number of hospital beds, are both considered in this model (Shortell, 1980). The economic approach holds that the interaction of the demand and supply factors dictates the volume of utilization (Feldstein, 1966; Jeffers, Bognanno, & Bartlett, 1971).

Along a similar vein, the organizational model is based upon factors within the health system which influence utilization. Physician practices, referral patterns and the use of ancillary personnel are among the variables considered in the organizational approach (Shortell, 1980).

The medical model of health service utilization stresses the more easily identifiable and quantifiable dimensions of utilization such as characteristics of the patient, the treatment regimen and the illness (Becker,

1974). Sociodemographic patient characteristics, the type, complexity and discomfort of the regimen, the medically defined seriousness, duration and disability of the illness are incorporated in the model. The major limitation of the model results from the relatively unalterable nature of the characteristics, restricting the potential for intervention aimed at improving utilization. Furthermore, the medical model does not account for the influence of patient motivation.

A behavioral model of utilization developed by Aday and Andersen (1974) has guided many utilization analyses (Branch, Jette, Evashwick, Polansky, Rowe, Diehr, 1981; Hulka & Wheat, 1985). It incorporates a number of variables contained in the aforementioned utilization models. This behavioral model conceptualizes utilization behavior as an interaction of the characteristics of the health care delivery system and those of the population at risk. The population at risk is characterized as having "predisposing, enabling and need characteristics" (Aday & Andersen, 1974). The predisposing factors refer to characteristics which exist prior to the onset of illness, such as educational background, and certain attitudes. Enabling factors are the means available to the individual for the use of services. Examples of these would be access to transportation and health insurance coverage. The need factors refer to the level of illness which is the cause of utilization whether perceived by the patient or evaluated by the provider.

Branch and associates (1981) purport that the use of the model provides insight into factors which inhibit, facilitate or do not affect health service utilization patterns.

2.1.2 The Systems Perspective

From a sociological perspective, the systems approach argues that factors from all the foregoing models must be considered in explaining variation in health service utilization. The approach encompasses three components: 1) the nature of health care inputs, 2)the transformation of inputs into patient services, and 3)the outcomes (outputs) of patient care (Shortell, 1980). Incorporation of these components in the systems approach captures the complexities that shape health service utilization, evidence of which is found in the literature.

The concept of the *health system* at the macro-sociological level for example, is expounded by Field (1973) who defines it as:

> that aggregate of commitments of resources which any national society "invests" in the health concern, as distinguished from other concerns (p. 763).

Field contends that the health system is a societal mechanism which converts generalized resources into specific outputs or health services.

The *health systems* approach to utilization models has been pursued by various authors. Andersen and Anderson (1979) describe the *health systems* approach as an

integration of many types of health service utilization models representing individual, community and organizational characteristics, broader socioeconomic and political characteristics of society, and of the physical environment. Each of these are described as subsystems and are conceptually linked in a general systems framework which specifies inputs, processes, outputs and feedback mechanisms.

Similarly, Anderson (1973) detailed a *social systems* approach viewing the health system as consisting of interrelated components which interact with one another and the population they serve. Anderson contends that *social systems* models can explicate causal structures in addition to incorporating elements of other utilization models. In this regard, *social systems* models may provide important insights into utilization behavior.

Although not explicitly stated, Meyers (1965) also incorporates a systems perspective in his Medical/Health Care Complex Model. The model provides a useful framework in which to discuss the competing and sometimes conflicting nature of the forces which influence health care decision making. Illustrated in the model are a series of interrelationships which affect utilization. The model demonstrates the relationship between the providers of service, who are influenced by their professional values and the health care environment; and the recipients of services, who are influenced by individual values and characteristics.

According to the model, the interaction of these parties is carried out in an environment which has been organized to perform medical care functions and is influenced by social values, characteristics and patterns.

Clearly, adherents to the systems approach emphasize the dynamic interdependence of the various system factors. Yet the operationalization of the systems approach is difficult, not only due to its inherent complexities, but also due to the different emphasis placed upon its various components. Interpretations of the systems approach are inconsistent among system scientists and sociologists. For example, whereas Churchman (1968) stresses the importance of system objectives, Andersen and Anderson (1979) emphasize feedback mechanisms. Despite such differences the systems approach offers a comprehensive alternative for health service utilization analysis and planning.

2.1.3 The Concepts of Need, Demand and Utilization

Analysis of health service utilization requires delineation of the central concepts of health needs and wants, as well as the demand for health services. The interaction of these factors result in utilization, or the actual quantity of services consumed. Distinction of these key concepts is important because they "underlie notions of equity" in health service distribution and allocation (Shortell, 1980, p. 50).

In the planning and evaluation of health services the allocation of resources among health services and populations should be consistent with the health needs of the population (Kalimo, 1979b). The concept of need is indeed one with which researchers grapple because it is difficult to differentiate necessary utilization from unnecessary utilization. In fact, the literature demonstrates large variations in quantitative measures of utilization (Hulka & Wheat, 1985; Szafran, 1985). The level of utilization demonstrated in the health system reflects the "met" needs of patients as perceived by providers. Recognizing that patients and providers perceive need differently, it is clear that the concept of need has an ambiguous meaning and requires further explanation.

Many different concepts of health service need exist in the literature, and a variety of definitions are put forth, each reflecting the concept from either the consumer or the provider perspective. A paternalistic view of need, which emphasizes the provider perspective, is suggested in the medical model presented by Jeffers and associates (1971) and Feldstein (1966) who propound that need is defined by medical authorities. Kalimo (1979a) and Shortell (1980) however, argue that need for services is also determined by individually perceived needs.

Further to this consumer perspective, Shortell (1980) and Jeffers and colleagues (1971) raise the concept of health service wants. These refer to the health services

that individuals perceive they ought to consume. Consumer wants for health services depend upon a variety of factors and are important determinants of consumer behavior (Jeffers et al., 1971). It is suggested that the demand for health services arises out of consumers attempting to satisfy wants.

The concept of demand enjoys no greater clarity in the literature. Shortell (1980) states that demand is "the quantity of health services that consumers wish to consume at specified prices..." (p. 50). Based on the interaction of factors affecting the patient's demand for treatment and those affecting the physician's use of the components of care, Feldstein (1966) defined demand as "the actual use of medical care services" (p. 130). Boulding (1966) submits that the demand concept implies consumer autonomy, choice and tailoring to preferences, the underlying premise of which is perfect information. Yet, in reality, the consumer of health services has insufficient information with regard to many decisions related to health service utilization.

Utilization is referred to as "the actual quantity of services that is consumed when demand is translated into care-seeking behavior" (Shortell, 1980, p. 50). As such, utilization is equated with observed demand and met needs, and is therefore a function of both demand and supply factors (May, 1984).

2.1.4 Theoretical Concepts

Other theoretical concepts are also relevant to the study of the elderly's utilization of health services. Owing to the discussions of life span and life expectancy which surround health service utilization and common misinterpretations of these concepts, some clarification from the literature is warranted. Life expectancy is an estimate of the average number of additional years a group of people will live, whereas life span is the maximum length of life for individuals (Yin & Shine, 1985). The significance of these concepts rests upon their relationship with interpretations and predictions of health service utilization.

Under the assumption of a biologically fixed life span, Fries (1980) refutes the notion of an older, more feeble elderly population in the future. On the basis of historical changes in mortality, survival and life expectancy, he maintains that the very old population will not increase and that chronic disability will occupy a smaller proportion of the life span. The author proposes his "compression of morbidity" construct (Fries, 1983), suggesting that the average period of diminished vigor will decline and the need for medical care by the elderly will decrease in the future. Verbrugge (1984) supports this construct in predicting a shift in morbidity for older people toward less severe symptoms, fewer chronic diseases and fewer limitations.

In contrast, Schneider and Brody (Canadian Hospital Association, 1984) argue that the elderly of the future are likely to require more care. They dispute Fries' (1980) assumption of a fixed life span and maintain that the elderly of the future are likely to live longer and "suffer extended periods of diminished functioning at the end of their lives" (Canadian Hospital Association, 1984, p. 9). In opposition to Fries, Schneider and Brody conclude, 1) the number of very old will rapidly increase in the future, 2) the average period of reduced vigor will occupy a larger portion of the life span, and 3) medical care needs by the elderly of the future are apt to substantially increase.

2.1.5 Summary

The foregoing selective review of utilization models and theoretical concepts accentuate the superiority of a systems approach to the present utilization research. The systems approach integrates various components of other utilization models such as those previously described and is able to coalesce pertinent theoretical concepts.

2.2 Determinants of Utilization

Determinants of health service utilization are of increasing interest in view of the current concern with cost containment in the health care sector. A selective review of the literature revealed substantial research findings indicating that utilization patterns are dependent upon a

variety of factors. Age, gender, levels of illness, health care facility proximity, patient income and perceptions of services are some of the factors which have been studied in relation to health service utilization.

2.2.1 Demographic Determinants

Among the primary variables related to health service utilization are age and gender (Andersen & Anderson, 1979; Anderson, 1963; Bognanni & Phillips, 1982). Anderson (1979) suggests that morbidity and mortality are directly related to age and gender which are inherent parts of the human biology and the life cycle. Fiedler (1981) questions the possibility of a "biological phenomenon" with regard to the greater morbidity of females than males. He does however support the age - morbidity relationship, noting the "U shaped relationship between age and utilization of services paralleled by the U shape relating frequency of illness episodes and age" (p. 134). Accordingly, as primary demographic variables, age and gender provide some insight into basic patterns and variation in health service utilization.

2.2.2 Social-Psychological Determinants

Social-psychological determinants of health service utilization are also examined in the literature. Anderson (1979) suggests that the perceptions of health service providers and recipients affect utilization. He describes a

relationship between social class and utilization claiming that lower class and lower income individuals have lower perceptions of symptoms needing care which results in reduced utilization. Anderson (1973) concurs by stating that the perceived threat of disease, in combination with the perceived value of health service intervention, account for much of the variation in consumer behavior.

Socio-cultural factors are also considered in utilization research. Providing the example of Jews utilizing Jewish hospitals, Bashshur, Shannon and Metzner (1971) suggest that powerful social variables relating to ethnicity modulate health service utilization. Supporting this contention, Fiedler (1981) notes cultural variables such as health education, values and practices which influence utilization.

2.2.3 Regional Determinants

Regional differences in hospital utilization have been the focus of a number of health service research projects (Bashshur et al., 1971; Bognanni & Phillips, 1982; Knickman & Foltz, 1985; Szafran, 1985). Throughout the literature, access to health services or barriers to access appear to play a key role in evaluating variation in utilization. The risks and difficulties peculiar to rural areas, for example, such as transportation and general lack of support services (Greene, 1984), make equitable access to health service in rural areas particularly difficult (Fiedler, 1981). Access

to the health care system, therefore, is an important determinant of utilization (Evashwick, Rowe, Diehr & Branch, 1984; Halevi & Benbassat, 1982).

Bashshur and associates (1971) argue however, that physical distance to medical facilities affects utilization differently for various segments of the population. The findings of their research indicated that socio-economic variables were positively related to hospital utilization. While they concluded that distance to medical services was important, they suggested that its effect as a barrier to utilization was a function of the preferences and goals of the patient. The availability of transportation and severity of the illness, for example, will affect the distance travelled and services used.

In a statistical analysis of reasons for regional differences in hospital utilization, Knickman and Foltz (1985) examined the effect of "population characteristics" and "health system characteristics" (p. 45). They defined the former as race, sex, age, income, marital status and living arrangements. The latter were defined as the number of hospital beds, the number of physicians, the number of specialists, and the availability of nursing homes. Their analysis of hospital use was measured by the number of admissions per year, the average length of stay and the total patient-days per year. Among the defined population characteristics, age, education and marital status had the strongest association with regional differences in

patient-day rates. Health system characteristics however, were found to be the dominant cause of regional variation in utilization. Variations in the numbers of non-surgical specialists and medical residents were associated with average length of stay. Further, although the number of hospital beds was unrelated to length of stay, it was positively associated with rates of admission. The researchers concluded that both population and health system characteristics influence utilization and can account for regional variation.

2.2.4 Clinical and Economic Determinants

Discussions found in the literature are indicative of the inextricable nature of clinical and economic determinants affecting utilization. In Canada, classical economic theory based upon a regulating price mechanism does not apply to the health care sector (Evans, 1984). Most individuals in Canada are insured against health care costs and consequently the demand for health care services does not respond to price changes. In fact, the physician generates demand and the demand for health care services follows the supply of health care services (Van der Gaage, Rutten & Van Praag, 1975). Research conducted by Bognanni and Phillips (1982) substantiates this hypothesis by concluding that the largest remaining factor in the variation of hospital utilization is the difference in physician "opinions concerning indications for

hospitalization" (p. 339). A study conducted by Roemer (1961) demonstrated a substantial increase in hospital utilization measures (admissions, patient-days, and average lengths of stay) when hospital bed supply was increased. It was thus concluded that an increase in the availability of hospital beds generates its own demand, specifically, it increases the hospital utilization rate. (This postulate is known as Roemer's Law.) Indeed, a number of authors reported a striking relationship between the supply of hospital beds and hospital utilization (Durbin & Antelman, 1964; Knickman & Foltz, 1985; Van der Gaage et al., 1975).

From a clinical perspective, this phenomenon may, in part, be demonstrated in the research of Griffith, Wilson, Wolfe and Bischak (1985) who concluded that high use of hospital services extends across both medical and surgical clinical dimensions. Some link between clinical dimensions and available resource supply may account for utilization variation. Insisting that patient demands are not the sole determinants of utilization, Roos, Shapiro and Roos (1984) contend that physician practice patterns, as well as disease diagnosis and treatment patterns, impact the utilization of health services.

2.2.5 Summary

A selective review of the literature suggests that, in general, determinants of utilization can be classified into three broad groups; 1)individual determinants, 2)societal

determinants, and 3) health system determinants. While the exact influence of these variables upon utilization behavior is not yet clear, the difficulty in separating their effect seems evident in the literature. Societal determinants, for example, influence individual and health system determinants of utilization. Indeed, from a systems perspective, these three major groups of determinants are inextricably linked, and can be viewed as forces which affect utilization (the end product of need, demand and supply).

2.3 Utilization of Health Services by the Elderly

The health care picture has changed dramatically in the past few years. Life expectancy has increased and the proportion of chronically ill or disabled and older Canadians has grown. The numbers of those aged seventy-five years and older has increased six-fold since the turn of the century (Gingras & Sherman, 1984). This proportion of the aging population, those seventy-five years of age and older, presents the health care system with a perplexing problem.

Noting that hospital use rises dramatically with age (Patterson, Crescenzi & Steel, 1984; Roos, Shapiro & Roos, 1984; Soldo & Manton, 1985), and in expectation of heavy demands on the health care system, a number of factors contributing to hospital use are cited in the literature. Technological imperatives and advances in medical science, which perpetuate aggressive or invasive curative approaches, have increased both life expectancy and hospital

utilization. Thus, in combination with the biophysiological aspects of aging and broader psychosocial factors, technologic norms and curative approaches have led to greater hospital utilization by the elderly.

2.3.1 The Impact of Technology

Medical technology has changed the nature of medical diagnosis and treatment (Canadian Medical Association, 1984). Advances in technology have enabled the extension of life but are unmatched with non-technical advances necessary to support the extended life requirements of the elderly (Butler, 1984). Technology has significantly affected the quality of life both directly, through the impact of curative intervention, and indirectly, through the prolongation of life.

Whereas the health care needs of the elderly are both qualitatively and quantitatively different from non-elderly individuals (Minaker & Rowe, 1985), the acute care hospital seems ill prepared to deal with the chronic nature of diseases and disorders of the elderly. Greater reliance on technology and concentration on curative rather than caring approaches has significantly altered the role of the physician and the consequent provision of health care services (Canadian Medical Association, 1984). Indeed, some authors suggest the health care system is plagued by a misuse of technology (Attinger, 1984; Kelly, 1985) which is identified as a symptom of the over use of health services.

2.3.2 Biophysiological Aspects of Aging

"Population aging, chronicity and frailty is and will continue to be a most important health problem" (Gingras & Sherman, 1984, p. 22). Though aging is a normal process, it is unique for each individual (Golightly, Bossenmaier, McChesney, Williams, and Wyble, 1984). Effective geriatric care therefore is complex and requires a wide array of professional and social supports (Korcok, 1981).

A concensus exists in the literature with regard to the relatively high utilization rate of acute care hospital beds by the elderly (Alexander, Evashwick, & Rundall, 1984; Brody, 1984). Although Brody (1984) states that illness and disability rise with increasing age, other authors caution against such generalizations and focus more upon the range of health status among the elderly. Kovar (1977) proposes that the elderly are not a homogeneous population. Siegler (1984) affirms this supposition by stating that the needs of the elderly cannot, in at least some respects, be aggregated. He submits that while the elderly are similar in age, they are dissimilar in other respects thus representing a heterogeneous population.

Gibson and Rowland (1984) agree that elderly individuals have different needs and require diverse resources. Indeed, Kovar's (1977) research substantiates this point, emphasizing that aging is "a process that continues over the life span at differing rates among different individuals" (p. 9). Though the "prevalence of

chronic disease and impairment increases sharply with age, (the inflection point being approximately seventy-five years of age)", within group variation of the elderly population is an important factor in evaluating the health status and needs of the group (p. 10).

Little agreement exists, however, upon the age divisions which constitute different health service needs. Kovar (1977) refers to those seventy-five years and older as the 'old-old' as does Somers (1980). Whereas Somers (1980) refers to those sixty-five to seventy-four years of age as the 'young old', Shanas (1984) extends that range by five years referring to this subgroup simply as 'elderly'. She labels those aged eighty years and more as the 'very old'. Although disagreement exists with regard to the age divisions of the population, the heterogeneity of the elderly age groups is recognized.

Age-specific morbidity and mortality patterns among geriatric subgroups cannot be ignored (Cornoni-Huntley, Foley, White, Suzman, Berkman, Evans & Wallace, 1985; Rubenstein, Josephson, Wieland & Kane, 1986). In particular, the medical needs of those aged eighty-five years and older require special attention because of the profound effect they have on the health care delivery system. It is believed that the dramatic increase in the absolute numbers of elderly, coupled with their unique health needs, will have a major impact on future health care delivery systems (Cornoni-Huntley et al., 1985; Minaker & Rowe, 1985).

Minaker and Rowe (1985) contend that the oldest portion of the elderly population, those eighty-five years and beyond, possess unique medical characteristics which are increasing the prevalence of disability due to chronic diseases and the vulnerabilities directly related to the aging process. The authors comment that age related reductions in organ function and a predisposition to certain diseases or processes apart from the biophysiological changes of advancing age, in combination, produce a marked variability in health status among the "oldest old". They caution that the variability and degree of both physiologic changes and disease states are greater in the "oldest old," thereby making generalizations regarding health status among the elderly very hazardous.

Distinct morbidity patterns of the hospitalized elderly have led to disease and diagnosis-specific studies of hospital utilization (Foreman, 1986; Posner, Gorman & Woldow, 1984; Rubenstein et al., 1986). As multiple diagnoses and chronic diseases interact with age-related physiologic changes, the disease or diagnosis-specific approaches to ascertain care needs of the elderly are frequently dismissed as inappropriate. Soldo and Manton (1985) however, submit that in view of the fact that the disease specific approach is explicit in the 1980 World Health Organization Morbidity Model as well as in the design of the Prospective Payment System in the United States, employment of a model which recognizes the relationship of

chronic disease to the need for health care services has value for forecasting health resource needs.

Whereas earlier research conducted by Berg, Browning, Hill, and Wenkert (1970) appraised the health care needs of the elderly population by the services and supervision needed by patients rather than by diagnostic criteria, current research focuses more upon diagnostic-specific approaches. Through the design of disease or diagnosis-specific studies, some researchers such as Foreman (1986), Herman, Culpepper & Franks (1984), and Posner and associates (1984) offer valuable insight with respect to the influence of particular diagnoses and diseases on health service utilization. Other authors such as Rice and Feldman (1983) review categories of diseases, and suggest the contribution of these categories to changing patterns of morbidity and levels of utilization.

The significance of disease or diagnosis-specific approaches to understanding health service utilization by the elderly is, in part, based upon the research of Branch, Jette, Evashwick, Polansky, Rowe and Diehr (1981). Employing the Aday and Andersen (1974) model of utilization, they attempted to increase understanding of the elderly's use of health care services. Recalling the predisposing, enabling and need variables outlined in the model, the results of their research indicated that need factors have the greatest effect on explaining utilization. The findings of their research suggested that:

> planning future services for the elderly based on demographic and economic characteristics will produce less accurate predictions of volume and type of service needed than will estimates of need based on measures of health and functional status of this population subgroup (p. 91).

Branch and associates (1981) conclude that the elderly's utilization of health services is more closely related to their physical and functional status than to their demographic and economic status.

2.3.3 Resource Utilization by the Elderly

The impact of the aging population upon the acute care hospital is broadly discussed in the literature. Evashwick (1982) predicts that the changing health status of the population and technologic trends will shift the emphasis in hospital care from short term acute toward long term episodic care, and maintains that hospitals will be forced to expand their scope as a result. Tedesco (1985) agrees and adds that hospitals need to re-evaluate their missions. In keeping with the findings of Butler (1984), Tedesco further suggests that hospitals must become "vertically integrated" (p. 53) to ensure "continuity over time and across multiple levels of care" (p. 58). Other authors concur with the need for hospitals to make a commitment to a system of comprehensive care for the diverse geriatric patient population (Gordon & Vadas, 1984; Halevi, 1985).

Rising health care costs and recognition of the disproportionate utilization of health care services by the

elderly have led to concern regarding the percentage increase in resources required to meet the additional demands indicated by the current demographic projections. Clearly, the major area of concern outlined in the literature is that of hospital use in general, and inpatient days specifically. Although there is some discrepancy in the literature with regard to the exact nature and magnitude of the impact of the aging population upon hospital use, obvious concern regarding the disproportionate use of health resources by the oldest portion of the geriatric population is evident. In Canada it has been suggested that the current demographic projections indicate a need for additional hospital beds (Canadian Medical Association, 1984). Similarly, British authors calculate a requirement for 20 percent more beds if the current level of care for the elderly is to be maintained in the future (Andrews, 1985).

From a cost perspective, increased demand for hospital beds is a critical concern. Andrews and Brocklehurst (1985) purport that more efficient use of hospital beds with better discharge planning can achieve a greater turnover of beds. Research undertaken by Lamont, Sampson, Matthias and Kane (1983) was aimed at determining which demographic, medical and sociologic characteristics of the elderly as recorded on admission to hospital would be of value in predicting any change in functional status. Their findings suggested that older age, namely those eighty-five and older, and abnormal mental status were predictors of functional deterioration.

The authors therefore assert that early assessment of elderly hospital admissions and early prediction of care requirements can lead to reduced lengths of stay. Such statements of potential reductions in hospital costs through earlier discharge, of long stay patients in particular, are common in the literature.

A recent Canadian study however, reveals that long stay elderly patients are actually inactive users of many hospital services (Hochstein, 1985). The study estimated the reduction in cost per day due to earlier discharge to be approximately 24 to 30 percent of the hospital per diem rate. Further to this point, the potential replacement of such inactive patients with active patients would in effect increase patient day costs as more hospital services and resources would be utilized by active patients (Evans, 1984). Consequently, early discharge would not reduce hospital costs through the decrease of per diem costs or the reduction of patient-days.

Lamont and associates (1983) insist however that the rising use of acute hospital care by the elderly, especially among the oldest old, suggests that changes which reduce lengths of stay could also reduce hospital costs. Adoption of this premise has given rise to research which explores the consequences of hospitalization among the elderly. Although the objectives of the studies vary, the findings are surprisingly similar.

As an example, the iatrogenic effects of hospitalization upon the elderly have been studied. McArdle, Wylie and Alexander (1975) described the serendipitous finding of their study which revealed that patients awaiting placement experienced a variety of untoward incidents in addition to their admitting complaints. Steel (1984) confirms this finding by listing decubitus ulcers, medication or procedural errors, anorexia, incontinence, mental confusion and falls as events which increasingly occur with prolonged hospitalization. The author quotes an earlier study conducted in California which reported that just under 5 percent of charts reviewed documented "potentially compensational events" (p. 445). Golightly, Bossenmaier, McChesney, Williams and Wyble (1984) also agree that "hospitalization intensifies the possibility of medical, iatrogenic and progressive functional complications" (p. 31).

Further evidence of the adverse consequences of hospitalization in the elderly is provided by Gillick, Serrell and Gillick (1982). In a study of 502 general medicine patients, these researchers examined the side-effects of hospitalization which were unrelated to patient diagnoses or therapies. They found symptoms of impaired psychophysiologic function, such as confusion, anorexia, falls and incontinence, unrelated to medical diagnoses or therapies in 8.8 percent of patients under seventy as compared to 40.5 percent of those over seventy

years old. Moreover, these researchers reported a rate of medical intervention secondary to these symptoms at 37.9 percent and 47.1 percent respectively, suggesting that the complication rate of intervention itself is likely 25 to 30 percent. The authors conclude that elderly patients are at a high risk of experiencing adverse effects of hospitalization and then of sustaining medical intervention which of itself may result in complications.

The appropriateness of acute care hospital utilization by the elderly has indeed become a salient health care issue. Bayne and Caygill (1977) indicate that most communities report inappropriate use of acute services by the aged and long waiting lists for alternative care. In a study of the medical and nursing needs of hospitalized elderly patients, Currie, Smith and Williamson (1979) present similar findings in which one third of the elderly patients studied received care which could have been delivered at home. These authors suggest that many elderly people are admitted to acute care beds due to non-medical factors rather than the need for medical or nursing services. Haug (1981) asserts that, in general, older persons are more likely to over-utilize health services for minor complaints then are younger individuals. Research conducted by Roos, Shapiro and Roos (1984), however, specifies that the elderly are not very high users of all types of health services. They argue that although the aged may use a disproportionate amount of hospital care, the

majority of elderly are infrequently hospitalized.

Statistics Canada's (1984b) report on hospital morbidity reflects the effects of age and gender on the utilization of hospital services. In 1961, for example, those aged sixty-five years and older accounted for 13 percent of all hospitalizations and 30 percent of all hospital days. By 1980-81, this same group accounted for 22 percent of all hospitalizations and 48 percent of all hospital days (p. 13). Similar trends in the major indicators of hospital utilization for the elderly population revealed 32.6 separations per 1,000 persons with an average length of stay (ALOS) of 25.4 days in 1971. Ten years later in 1980-81, these figures rose to 34.2 separations and 25.8 days respectively (p. 21), indicating a trend towards more hospital admissions, and slightly increased lengths of stay which may reflect the effects of delayed placements.

Using standardized population rates, tabulation of days of care for the Canadian elderly demonstrated some differences among genders. In 1980-81 elderly males utilized 8.6 million days of care while elderly females utilized 11.8 million days of care, reflecting a small increase for males and a substantial increase for females from the previous year (p. 39). Further variation in utilization between genders was provided by Statistics Canada's rather tenuous calculation of days per separation for elderly subgroups in 1980-81. The sixty-five to seventy-four year old male age

group utilized 17.5 days per separation while the female counterpart utilized 19.9 days per separation. A more dramatic difference was demonstrated in the seventy-five year and older group in which males utilized 28.1 days per separation and females utilized 37.7 days per separation (p. 39). These comparisons may be misleading, however, as they lack a per capita basis.

The disproportionate consumption of hospital resources by the elderly seems to be best explained through the analyses of utilization patterns by particular subgroups of the elderly. For example, while similar patterns of utilization exist among elderly cohorts, the highest rate of hospitalization was demonstrated in the "old old" (those eighty-five years of age and older). Four percent of this oldest old group accounted for 32 percent of acute care hospital days used by this group (Roos, Shapiro & Roos, 1984). Another study which examined within group utilization differences among the elderly was that of Shapiro (1983), who demonstrated the significant impact of impending death on the use and cost of health care services. Again, the disproportionate consumption of health care resources by elderly subgroups was confirmed as Shapiro reported that 5 percent of the elderly patients who died accounted for 20 percent of all hospital days used by the elderly.

The aging of the population and its implications for hospital based services is indeed an international concern. Numerous studies are documented in the literature confirming

concern with the provision of hospital services to the elderly (Alexander, Evashwick & Rundall, 1984; Davies, 1985; Farrow, Rablen & Silver, 1976; Lawrence 1985; Michaeli, Ficu, Mor & Har Paz, 1984). International comparative studies such as those conducted by Bacon, Watjyniak and Krzyzanowski (1984), Grundy and Arie (1984), and Shanas (1984) compare utilization patterns among countries and offer valuable insight into factors which affect the utilization of health services.

These international studies indicate that the elderly are leading users of hospital care. The concomitant costs of their care have served to direct attention to the socio-medical needs of the elderly (Bacon et al., 1984; Shanas, 1984). It has been suggested that the utilization of medical services by the elderly only partially depends upon the nature of illness among them (Shanas, 1984). The value judgements of providers and society as reflected in the organization and delivery of health care services also determine utilization. While a number of factors influencing utilization are cited in international studies, two factors in particular seem to take precedence: (1) the role of the family, and (2) the presence of disability.

A study of health care facilities in Japan, where society and the family structure are rapidly changing, indicated that the hospital plays the most important role in caring for the elderly (Lawrence, 1985). The waning of the extended family has decreased the availability of family

support systems, a significant factor in the elderly's use of institutional services in Japan (Grundy & Arie, 1984) and North America (Berg, Browning, Hill & Wenkert, 1970).

In a study of international comparisons of institutionalization and the elderly, Grundy and Arie (1984) demonstrated a relationship between the prevalence of mental and physical disability and the elderly's use of institutional services. They suggested that mental disability, particularly in those elderly patients who were without family support, generated an even greater need for institutional services. Farrow and associates (1976) concur, stating that mental disability affects trends in hospital admissions.

Long-stay[1] patients have been the source of some research as they create substantial demands upon hospital bed resources. Early research by Rosenfeld, Goldman and Kaprio (1957) examined the reasons for prolonged hospital stays. They delineated a number of socioeconomic and psychologic factors, in combination with medical factors, which contributed to utilization patterns, and noted the implications of inappropriate utilization. Later research conducted by Restuccia and Holloway (1976) attempted to identify and measure significant factors which caused the misutilization of hospital beds. These authors defined "barriers" to appropriate utilization and classified them

---

[1]The definition of long stay in the literature lacks unanimity, ranging from a stay greater than thirty days to one greater than ninety days.

according to the following "areas of responsibility": 1) physician responsibility, 2) hospital responsibility, 3) patient-family responsibility, and 4) environmental responsibility (p. 562). They concluded that the majority of barriers arose from physician and environmental responsibilities thereby confirming the multi-faceted nature of factors which influence utilization of health care services. More recent studies of long stay patients emphasize patient characteristics such as gender, functional ability and diagnosis (Hodkinson & Hodkinson, 1981).

Clearly a multitude of views can be found in the literature regarding the elderly's utilization of health care services. Given that most of these views are based upon studies of utilization data, and thus focus on the use of health services as opposed to the non-use of health services, the perception of health care service utilization by the elderly is magnified. Roos, Shapiro and Roos (1984) emphasize that the majority of elderly are healthy and infrequent hospital users. According to their Manitoba study, a small group of elderly account for a large proportion of hospitalizations. Their findings indicated that:

> less than 1/4 of the elderly are hospitalized in any given year and that a much smaller proportion (5%) consume almost 2/3 (59%) of the hospital days used by the elderly in a 1 year period (p. 33).

2.3.4 Bed Blocking

Authors agree that there is a tendency toward a growing utilization of hospital services by elderly patients with chronic diseases and diseases of old age (Halevi & Benbassat, 1982; Mausner & Bahn, 1974). Hence the concern regarding the *back-up* of geriatric patients in acute care hospitals is generally indicative of the rising concern with regard to the appropriate use of acute care hospital beds. The back-up in acute care hospital beds of geriatric patients who have recovered from the acute stage of illness but are not promptly discharged, render these beds unavailable for another admission or *blocked*.

Back-up geriatric patients are also referred to as *holdover* patients (Shapiro & Roos, 1981), and the resultant *bed-blocking* has emerged as a salient health care issue (Markson, Steel & Kane, 1983; Meiners & Coffey, 1985). The terminology and definitions used to describe the phenomenon reflect, to some degree, the implicit value systems and orientations related to the issue. Rubin and Davies (1975) for example, apply the term blocked-bed in a most general sense making no distinction regarding the appropriateness of placement. Shapiro and Roos (1981) however, refer to the blocked-bed as a consequence of health system inefficiencies which result in a misuse of beds.

The problem of bed blocking is not solely related to the nature of patient characteristics but also involves the organization of the care they receive (Hall & Bytheway,

1982). Employing an organizational and systems perspective, Hall and Bytheway (1982) contend that bed "blocking is inherent in any system where the rate of output is below the rate of input" (p. 1988). They suggest that the blocked-beds issue represents beliefs about the purpose of hospitals and the nature of care provided.

In fact, the organization of health care provision and its implications for service delivery have been the subject of some current research. Geriatric utilization of acute care hospitals in Manitoba was studied by Shapiro, Roos and Kavangh (1980) over the period from 1972 to 1976. The researchers noted that average lengths of stay were determined by case-mix and the period of time required to treat each type or category of illness. Their study revealed a stable case-mix yet an increasing length of stay. They concluded that despite the provision of alternatives to acute care, such as the expansion of home care programs, the increased availability of nursing home and rehabilitative beds, and the removal of financial barriers through publicly financed universal insurance coverage, "long hospital stays appear to be disproportionately associated with transfer problems" (p. 347). Shapiro, Roos and Kavangh therefore disputed some of the earlier claims of The Hospital Council of Metropolitan Toronto study, (cited in Shapiro et al., 1980) which suggested that bed blocking was due to a shortage of alternative programs and beds, and supported the claim that lack of coordination between acute and long term

care facilities, coupled with inadequate discharge planning, contributed to bed-blocking.

Similar findings were reported in an American study of "Administratively Necessary Days" (ANDs) which demonstrated considerable inter-hospital variation deemed closely related to the placement practices of the study hospitals (Markson, Steel & Kane, 1983). In the United States, back-up patients are afforded the AND status when they no longer require acute care. Markson and associates (1983) undertook a review of the effect of bed supply and demand upon ANDs. In keeping with the conclusions of Shapiro, Roos and Kavangh (1980), Markson and his colleagues maintain that ANDs highlight the failed coordination between acute and long term care. They concluded that the problem of bed-blocking in acute care hospitals seemed to reflect the inappropriate use of beds rather than a bed shortage.

Although not limited to the aged, bed blocking is always associated with the elderly (Hall & Bytheway, 1982; Salter, 1982). In a small scale study of acute medical wards in Britain, McArdle, Wylie and Alexander (1975) reported a 33 percent occupancy of acute medical beds by patients who were under one consultant and no longer required medical care. In a cross-sectional survey of orthopedic and surgical beds, Murphy (1977) reported a 16 percent occupancy by patients without need for acute medical care. Both sets of data suggested that those "at risk" of becoming long stay patients were generally seventy-five years or older.

Further, Murphy noted that females and individuals without family supports were also at a relatively higher risk. Given the differences of the British health system and the Canadian system, the magnitude of the findings from these studies is subject to question. The general trend and implications of these studies, however, are relevant to the Canadian experience. Researchers appear to agree that the significance of bed-blocking is related to the misallocation of expensive technology, resulting in a disservice to the patients who are misplaced.

2.3.5 Summary

The provision of appropriate health services to the elderly is a major challenge. In order to meet this challenge, factors which influence utilization by the elderly must be identified. Health service research has begun to uncover some of these factors. To date, individual, health system and societal determinants have been identified as factors which influence hospital utilization. Undoubtedly the utilization of health services by the elderly is of increasing interest and concern to health professionals, health service administrators and policy makers.

2.4 Classification Systems

Classification is a systematic arrangement of study subjects into groups or categories according to established criteria. Classification is a general technique which

facilitates data management through the meaningful grouping of data. In the health care field such categorization of data provides an avenue to useful information regarding health service utilization. Relevant applications of classification methods in the health care field are disease classification, patient classification and case-mix measures.

2.4.1 Disease Classification

In an historical review of disease classification systems, the World Health Organization (1977) documents the attempts to classify diseases as early as the mid 1700s. By the mid 1800s, both nomenclature and statistical classification were under constant study. The adoption of an international list of causes of death occurred in 1893, and was based upon the principle of distinguishing between general diseases and those localized to a particular organ or anatomical site. By the 1920s, discussions were underway regarding the tabulation of statistics of morbidity using classification. "The Sixth Decennial Revision Conference marked the beginning of a new era in international vital and health statistics" (World Health Organization, 1977, p. xii). Apart from approval of a comprehensive list for both mortality and morbidity, and agreement upon international rules for selecting the underlying causes of death, the adoption of a comprehensive program of international co-operation in the field of vital and health statistics was

recommended.

Following the sixth revision of the International Classification of Diseases (ICD), the Commission on Professional and Hospital Activities (CPHA) began experimentation with the ICD for indexing medical records. Recognized as an efficient information system by 1959, the use of the ICD for indexing medical records was officially encouraged by the American Hospital Association and the American Association of Medical Record Librarians. Soon after, the combined experience of major ICD users was pooled to prepare a modified version of the ICD for hospital use. The result was the first ICDA, the A standing for "Adapted for Indexing Hospital Records" (Commission on Professional and Hospital Activities, 1973, p. xv).

Concurrent with the eighth revision of the ICD, a newly adapted version of the ICDA for hospital use was issued. The A in ICDA came to mean "Adapted for Use in the United States" and now included the classification of mortality data. Moreover, the revised ICD and ICDA corresponded precisely at the three-digit level whereas the earlier ICDA had modified the three-digit categories wherever necessary to accommodate the requirements of hospitals.

The maintenance of the three-digit ICD structure throughout the ICDA, however, limited its suitability for hospitals. Since the ICD was "designed primarily for mortality classification, the needs of morbidity classification ... [were] ... occasionally sacrificed in

favor of clarifying the underlying cause of death" (CPHA, 1973, p. xv). Consequently, the 'Hospital Adaptation of ICDA' (H-ICDA) was developed.

The H-ICDA was based upon the eighth revision of the ICD and the ICDA. While the code meanings were retained wherever practical, deviation from the three-digit categories of the ICD was undertaken wherever appropriate. As a result, the ICDA and H-ICDA were translatable, one to the other and therefore to the ICD-8 with rare exception.

Recalling that the International Classification of Diseases was developed from the 1893 International List of Causes of Death, the use of the ICD has been greatly expanded over the years. In addition to its traditional epidemiologic application, the ICD evolved to encompass the "... indexing and retrieval of records and for statistics concerning the planning, monitoring and evaluation of health services ..." (World Health Organization, 1977, p. xiv). Proposals for the ninth revision of the ICD revealed the need for a more radical revision "... on the grounds that the structure of several of the ICD chapters were out of touch with modern clinical concepts" (p. xv). Hence, the more detailed ICD-9 system is the ninth revision of the ICD and replaced the aforementioned classification systems. The ICD-9-CM is the "clinical modification" of the same system.

The current structure of the ICD system is based upon eighteen generic categories of disease, such as neoplasms and diseases of the digestive system. Each category has a

further five levels of subdivision which increase in specificity. The more specific levels of the classification tend to be most affected by revisions and modification of the ICD.

An abridged version of the ICD-9 is produced by Statistics Canada and is entitled the Canadian Diagnostic List (CDL). The current CDL, corresponding to the ICD-9, contains 211 disease and injury categories. The purpose of the CDL was to adapt the classification system to Canadian morbidity and mortality patterns.

Over time, other individuals and groups have recognized the limitations of etiological or anatomical disease classifications and as a result have developed alternative disease classifications. Noting the evolutionary process of disease, Mausner and Bahn (1974) discuss classifications based upon stages of disease. The utility of disease staging among medical specialities is demonstrated by oncologists who use staging based upon symptomatology or the morphologic extent of disease, and by cardiologists who use functional and therapeutic classifications. Disease staging as a means of classification permits emphasis upon pertinent and unique elements of disease processes, among the areas of medical specialization which are largely unrepresented in morphological classification systems.

Weaknesses of the etiological based classification systems have been identified in the literature. Based upon their development of a patient classification system for

long-term care, Bay, Leatt and Stinson (1982) point to the uncertain etiologic basis of disease processes as a major source of inadequacy in disease classification in the area of long-term care. Noting the ambiguous nature of some disease diagnoses for chronic patients, they suggest categorization of such diseases could be somewhat arbitrary. Secondly, co-morbidities constitute situations in which judgements are required concerning the dominant diagnosis. Thirdly, the authors note that wide variations in therapeutic or care requirements within disease categories are unaccounted for in etiological classification systems.

Hurtado and Greenlick (1971) submit that disease classification systems which are not primarily designed for the analysis of health service utilization are not particularly adaptable to utilization analysis. In support of this contention Fries and Cooney (1985) advise that within the long-term care context, diagnosis is only weakly predictive of health resource consumption. The development of Resource Utilization Groups (RUG) in their research indicated that "no individual ICD-9 disease code proved useful in differentiating groups at any stage of the analysis" (p. 118). In response to the aforementioned weaknesses of disease classification systems and the need for predictive tools regarding resource requirements, other classification systems have been developed; in particular, the patient classification system.

2.4.2 Patient Classification

Patient classification is generally defined as "the grouping of patients according to some observable or inferred properties or characteristics" (Giovannetti, 1979, p. 4). Employing a long-term care perspective, Bay and his colleagues (1982) elaborate upon this definition and propose that patient-oriented classification systems are "based on observed similarities of patient characteristics, rather than on cause or etiologic considerations" (p. 470). Accordingly, a classification decision is reached through the assessment of a broad range of health related patient characteristics.

The development of acute care hospital in-patient classification systems was primarily in response to the "variable nature of nursing care demands" (Giovannetti, 1979, p. 4). Patient classification provided a mechanism by which patients were categorized according to their nursing care requirements. Consequently, it served the original purpose of defining nurse staffing.

Since the original focus on nursing staff allocation, patient classification research has expanded to encompass broader applications in the health care field. Two distinct structures of patient classification are identified in the literature, namely **levels-of-care** and **types-of-care**. Operating at different strata in the health care system, these two classification structures differ in their purpose (Bay et al., 1982). The levels-of-care scheme classifies

specific resource needs in relation to the intensity of care required by the patient; whereas the types-of-care scheme classifies patient need in relation to the placement of patients among alternative institutions and programs.

Applications of types-of-care and levels-of-care classification systems in long-term care have been studied by notable researchers. Building on the original types-of-care classification concept introduced by a Canadian Federal Working Party Report, Bay, Leatt and Stinson (1982) developed an Assessment/Classification/-Placement Model for long-term care. The objectives of their research were twofold: 1) to improve placement decisions, and 2) to provide useful information for planning and resource allocation. More recently, Fries and Cooney (1985) developed a levels-of-care classification system for long-term care which clusters patients with similar relative needs for resources, in particular, for nursing time. As such, these clusters of patients, denoted in the study as 'Resource Utilization Groups', lend themselves to a variety of applications for a measure of resource consumption, notably a case-mix system. Evidently, current patient classification systems, both levels and types, are emerging as sophisticated measures of health resource consumption.

Perhaps as a result of these more comprehensive and sophisticated applications of patient classification systems, validation has become a central concern. In the absence of an appropriate validation, the utility of any

classification scheme is severely limited (Bay, Leatt and Stinson, 1982). Yet validation remains a difficult and complex task.

In terms of levels-of-care classification systems, Giovannetti (1979) cautions that none of the instruments have demonstrated validity in relation to actual patient need, nor are they ever likely to do so. While this is a major point of criticism, Giovannetti (1979) argues that it is unfair. The author clarifies this point by explaining that patient classification systems group patients in terms of "the amount of nursing care time to be received according to a predetermined standard of care ..." (p. 7). Consequently, the concept of actual nursing care needs of patients, if they are in excess of the predetermined standard of care, is not only irrelevant but also inappropriate.

Levels-of-care classification systems are relevant to the present research. To date, the literature reveals a variety of generalized groupings of patient characteristics including the use of diagnostic categories. Brewster, Karlin, Hyde, Jacobs, Bradbury and Chae (1985) for example, propose a clinical approach to patient classification based upon severity of illness at admission. In an effort to capture economically relevant dimensions of disease, Luke (1979) reported that reliable and valid weighting schemes can be applied at aggregate levels of patient grouping. Yet, such categorizations do not adequately reflect actual levels

of resource need or consumption among similar groups of patients.

The inadequacy of patient classification systems in delineating interinstitutional levels of resource consumption has led to the development of case-mix measures. As such, a framework is provided for an ongoing process of comparative analysis of health care utilization and performance.

2.4.3 Case-Mix Measures

Pursuant to the concerns regarding rising health care costs and the interest in more equitable reimbursement schemes, case-mix measures have evolved to contribute to hospital performance evaluation. In order to evaluate, compare and provide relevant feedback with regard to hospital performance, however, hospital product characteristics and external characteristics of hospitals must be identified. In this way, hospitals can be classified according to their similarities and evaluated on this basis. To date, various approaches to case-mix measures have emerged and undergone study. The utility of each approach, of course, is contingent upon the ultimate use of the evaluation undertaken.

The heterogeneous nature of hospital product characteristics or outputs has long been recognized, as has the utility of classifying hospitals according to their similarities for the purposes of comparison. Early attempts

at hospital classification centred on the more obvious characteristics of hospitals. Morrill and Earickson (1968), for example, suggested a four level hierarchical classification of hospitals based upon the level of service offered and the overall hospital size. The level of service was defined as a "... function of the presence or absence of various specializations" (p. 225) and as such encompassed the number and scope of services and facilities, the nature of resident and intern programs and the size of medical staffs. Hospital size was determined by the number of beds. Other authors also classified hospitals according to the services provided (Carr & Feldstein, 1967; Berry, 1970).

Based upon the need for hospital performance evaluation, the United States Social Security Administration (SSA) categorized hospitals according to three factors: urban versus rural location, per capita income, and hospital size (Phillip & Iyer, 1975). The rationale provided for this classification was that hospital groups which were similar in terms of product mix and external environment could be expected to have similar output costs given similar levels of operational efficiency. Phillip and Iyer (1975) challenged this rationale insisting that "no classification of hospitals, ... can capture all the nuances relating to product mix and environmental characteristics" (p. 350). Furthermore, the authors argued the underlying assumption of the SSA's method which suggested that the levels of efficiency of the average hospital in the group met

acceptable standards. Overall, the "discretized" variables used by the SSA were believed inadequate in classifying hospitals (p. 350). In recognition of the inadequacies of the SSA hospital classification method, Phillip and Iyer (1975) proposed a polythetic classification scheme utilizing cluster analysis techniques.

Faced with the need to measure hospital outputs more accurately, hospital classification and performance comparison have led to the development of case-mix measures. Klastorin and Watts (1980) contend that "measurement of the diagnostic mix of patients treated in hospitals is essential to the characterization of activity in this industry" (p. 675). Case-mix is an application of classification theory which involves the arrangement of patients into groups according to presumed similarities (Horn & Horn, 1986). Recognizing that each patient is unique, Fetter, Shin, Frieman, Averill and Thompson (1980) propound that certain demographic, diagnostic and therapeutic attributes are common among patients, and determine the type and level of hospital services required. Consequently, case types are established according to the similarities of identified clinical attributes or processes of care.

The importance of homogeneous groupings among classification schemes is outlined in the literature (Hornbrook, 1982; O'Neill, Zador, & Baker, 1979). Ideally the case-mix system should differentiate among patients only by those variables related to the condition of the patient

and the treatment processes that affect his utilization of services (Fetter et al., 1980). "Any variation in actual resource use would result not from patient characteristics but rather from hospital management and physician practice patterns" (Berenson & Pawlson, 1984, p. 844). Analysis of patient data however, has indicated that patient classifications based on discharge data "do not necessarily result in patient categories that require similar management or similar hospital services" (Young, Swinkola, & Zorn, 1982, p. 501). Young and his associates (1982) contend that clinically similar patients, even the same patient readmitted, can have a variety of diverse yet appropriate reasons for hospitalizations. Accordingly, utilization of hospital resources will differ among hospital episodes.

Therefore, while it is useful to classify patients according to similarities, the more critical factor for improving hospital management and planning is the ability to measure the heterogeneous nature of hospital case-mixes (O'Neill et al., 1979; Young et al., 1982). Pekarna, McWilliams, McLaughlin and Appel (1982) report variation in utilization patterns among hospitals due to differences in hospital services offered and user population morbidity. Young and his colleagues (1982) add that variable patterns of patient management within and among hospitals are significant when evaluating the appropriateness and cost of care. Case-mix measurement attempts to reflect these differences.

The significance of differences in case-mix among hospitals in relation to resource consumption is generally agreed. For a variety of economic and political reasons, diagnosis-specific measures of hospital case-mix are being utilized (Luke, 1979). As a result, the literature is replete with terms referring to levels of resources required or the criticality of disease, both of which are designed to "characterize economically relevant dimensions of disease" (p. 39).

Weaknesses of diagnosis-specific measures have also been identified. Hornbrook (1982) describes three concerns with the use of diagnostic classification schemes for case-mix measurement. Firstly, each patient must be assigned to a single case type. This may lead to arbitrary classification and within group heterogeneity when patients' illnesses are multiple or defy diagnoses. Secondly, unspecified or miscellaneous categories must be minimized, again so that within class heterogeneity is not a significant problem. Thirdly, insufficient information creates a barrier to classification. Two manifestations of this concern are "incomplete recording of diagnostic data, and lack of a basis to assign a diagnosis" (p. 98). These concerns are supported by Doremus and Michenzi (1983) who confirm a "substantial level of imprecision and error in hospital discharge data" (p. 1002).

Nevertheless, efforts to improve case-mix schemes continue because case-mix is "a methodology that is

administratively useful for partitioning patient services and determining resource allocation" (Doremus & Michenzi, 1983, p. 1001). Moreover, the collective classification of a hospital's case-mix provides a means for examining hospital products since patients in each class are expected to receive similar products or outputs (Fetter et al., 1980). The significant impact of both patient factors (such as demographic characteristics and clinical attributes), and hospital factors (such as physician practices and treatment regimens), in influencing hospital outputs or product is clearly recognized in the literature (Brewster, Karlin, Hyde, Jacobs, Bradbury & Char, 1985; Fetter et al., 1980; Young et al., 1982).

Acknowledging the influence of both patient factors and hospital factors, Shachtman, Knapinn, Quade, Freund and Kronhaus (1986) proposed a method for constructing case-mix indexes. Using length of stay as the patient outcome, the authors suggest that variation in patient outcome is due to either patient factors or hospital factors. The authors employed a methodology that presumably reflected the presence of hospital factors which positively or negatively affected lengths of stay. The use of length of stay measures however, is controversial. Some authors dispute the utility of such an output measure claiming it embodies inefficiencies in the system, or more specifically, it may not reflect true need (Hornbrook, 1982; Young et al., 1982). Shachtman and his associates (1986) acknowledged the

weakness of using length of stay alone as a measure of resource use and noted the importance of incorporating measures of illness severity into a classification scheme as these may influence lengths of stay.

The development of diagnostic related groups (DRGs) as a means of measuring hospital output is significant by virtue of their recognition of case complexity. Yet, Horn and Schumacher (1982) contend that a severity of illness measure must be incorporated into classification schemes if appropriate comparisons among hospitals are sought. For the purposes of utilization review, reimbursement or quality studies a measure of severity "adds greatly to an understanding of the data" (p. 499). By incorporating co-morbidities and complications, DRG developers attempted to integrate illness complexity but not illness severity into a classification scheme.

Fetter and his associates (1980) are accredited with the development of the DRGs. The aim of these researchers in constructing the DRGs was to relate

> the demographic, diagnostic, and therapeutic characteristics of patients to the output they are provided so that cases are differentiated by only those variables related to the condition of the patient (e.g., age, primary diagnoses and treatment process (e.g., operations)) that affect his utilization of the hospital's facilities (p. 2).

The advantages of DRGs include: 1) a reduction of the number of case types over other disease classification systems, 2) relatively simple application, 3) improved case-mix measurement over more aggregative schemes, and 4)

familiarity to hospital personnel (Hornbrook, 1982). Despite these advantages, Hornbrook (1982) underscores an important theoretical deficiency of DRGs. He notes that DRGs are "based on empirical patterns of practice, rather than on the most appropriate and efficient treatment processes" (p. 87). Under this premise, DRGs "represent treatment patterns more than disease patterns" (p. 91).

In the early stages of DRG development, using "diagnostic-related product groups" as a means of hospital comparison, Thompson, Fetter and Mross (1975) grouped patients into;

> diagnostic categories based on significant differences in the utilization of hospital resources, considering such additional features as age, sex, presence or absence of specified surgery and complications (p. 302).

The findings of their study revealed significant differences in case-mix among hospitals within all but one of the diagnostic groups studied. Moreover, they observed marked differences in the resources used to treat patients.

Perhaps as a result of such earlier research, case-mix and case complexity have been the subject of much of the recent literature related to hospital classification. The new hospital reimbursement system introduced in 1983 in the United States is a per case payment methodology that uses DRGs to measure a hospital's case-mix in order to adjust for actual variations in resource use and clinical complexity (Berenson & Pawlson, 1984). As such DRGs represent hospital activity based on case-specific parameters rather than on

the volume of service provided. A per case prospective hospital reimbursement system is based upon the DRGs regardless of actual resources utilized.

In Canada, hospital case-mix profiles remain under study. Cluster analysis, a technique which suggests natural groupings, continues to be employed in the area of hospital classification. Bay, Nestman and Leatt (1981) applied clustering techniques to group hospitals based on similar case-mix composition. Among their findings the researchers concluded that cluster analysis can, if properly employed, be useful for classifying hospitals and may result in a high level of homogeneity in relation to case-mix profile.

2.4.4 Summary

Applications of classification theory relevant to the health care field are, in part, a means of summarizing and categorizing a mass of patient data into a reduced and meaningful format for various evaluation and planning purposes. The three major classification applications reviewed, namely disease classification, patient classification and case-mix measurement, provide the basis for the current research. Early disease classification systems proved narrow in scope and as such excluded important variables which helped to explain variation in utilization patterns. Patient classification systems were then developed to account for some of these variations. While these were successful at the intra-institutional

level, they were inadequate for inter-hospital comparisons. Current research focuses upon the utility of case-mix measurements, recognizing the strengths and weakness of the other classification systems. Based on the knowledge of these strengths and weaknesses in combination with the integration of certain elements of these previous classification systems, hospital case-mix measures hold promise as a valuable measure of hospital performance.

2.5 Discharge Status

The projected growth of the elderly population and the concomitant impact upon the utilization of health services have created concern with regard to the discharge status of geriatric acute care hospital separations. Financial pressures and resource constraints now stimulate interest in the linkages between acute care hospitalization and geriatric patient outcomes. Better knowledge of the patient outcomes of hospitalization promote cost efficiency and quality care. A review of the literature relevant to geriatric discharge status focused upon determinants of discharge status and discharge destination.

2.5.1 Determinants of Discharge Status

The current literature indicates that a multitude of factors influence the discharge status of elderly patients from acute care hospitals. Predisposing patient characteristics, health system characteristics and social

support systems all contribute to patient outcomes. Despite the paucity of literature on the topic of patient discharge status, studies to date exhibit several areas of agreement with regard to the determinants of geriatric discharge status.

A number of studies outline patient characteristics as predictors of discharge status. Kane and Matthias (1984) reported that long-term placement was associated with age, gender, mental status, and multiplicity of diagnoses interacting with age. Functional ability as determined by an individual's ability to sustain self-care is also reported to contribute to the need for long-term placement (Markson et al., 1983; Teasdale, Shuman, Snow and Luchi, 1983; Wachtel, Derby, & Fulton, 1984). A study of discharge patterns and lengths of stay conducted by Frank and Lave (1985) concluded that age, marital status and organic brain disorders were significant explanatory variables for long-term placement from acute care hospitals. Conversely, Davis, Shapiro and Kane (1984) found no correlation between age, gender or marital status and long-term placement.

In a comparative study of elderly admissions discharged home versus those discharged to a nursing home, Wachtel and associates (1984) noted the cumulative effect of variables in predicting discharge status. The number of previous hospital admissions, as well as the complexity of new pharmocologic regimens, were demonstrated to influence elderly discharge status. As such, the researchers

established the effect of case complexity as a determinant of discharge status.

Diagnosis is also recognized as a predictor of discharge status (Kane and Matthias, 1984; Kane, Matthias and Sampson, 1983). Kane and associates (1983) conducted a study of elderly discharge patterns following acute care hospitalization in which they demonstrated a relationship between diagnoses and long-term care placement. They observed that elderly patients who had undergone invasive surgical procedures were less likely to be placed in nursing homes. Mental disorders however, increased the probability of nursing home placement. More importantly, the study results revealed an additive effect of diagnoses in nursing home placement. Of the patients discharged to nursing homes, 9.1 percent had physical diagnoses only, 16.9 percent had mental diagnoses only, and 27.2 percent had mixed (both physical and mental) diagnoses. Yet, Marchette and Holloman (1986) claim that diagnosis acts simply as an "intermediary factor" (p. 17) in determining discharge status.

Health system characteristics as demonstrated by hospital-specific geriatric discharge patterns have also been addressed in the literature. Kane and associates (1983) compared geriatric discharge patterns between a university medical centre and a community hospital. They observed a striking difference in which 3 percent of the university hospital patients were placed in nursing homes as compared to a 10 percent nursing home placement of the community

hospital patients. Further study of this finding revealed differing sources of admission and likelihood of surgical procedures. The authors concluded that the discharge patterns of community hospitals cannot be extrapolated to university hospitals. Markson and associates (1983) also noted hospital specific discharge patterns. They observed that non-teaching hospitals reported a higher proportion of placements in skilled nursing homes. Davis and associates (1984) suggest that such differences among hospital types may be due to hospital specific case-mix differences or discharge planning procedures which are affected by physician and nursing practices.

Social support systems have been clearly identified as significant determinants of discharge status. The presence of social supports partially dictates decisions regarding patient placement following an acute care hospitalization (Frank and Lave, 1985; Teasdale et al., 1983; Wachtel et al., 1984). Familial support systems, in particular, contribute to decisions regarding geriatric discharge status (Markson et al., 1983). In a study of the use of community services by the elderly following an acute care hospitalization, Victor and Vetter (1985) reported that the family played the central role in caring for the elderly following discharge from hospital. By extrapolation, the availability of familial support systems may, in part, determine geriatric discharge status.

2.5.2 Discharge Destination

The literature pertaining to geriatric discharge destination embodies three central concerns which are indicative of the broader goal of providing cost efficient, quality care. Firstly, a recurring concern is that an appropriate level of service provision be matched with each geriatric discharge. Secondly, expedient discharge from the acute care hospital is a major concern as the elderly are charged with bed-blocking. Thirdly, concern with respect to the geriatric rate of readmission to acute care hospitals prevails in the literature. These major issues arise from the need to achieve cost constraint and quality care, which present juxtaposed incentives for geriatric discharge. Consequently, attention has been drawn to the process by which decisions are made regarding elderly discharge status.

The importance of discharge planning has thus been emphasized in the literature. Shine (1983) has defined discharge planning as a

> process of activities that involve the patient and a team of individuals from various disciplines working together to facilitate the transition of that patient from one environment to another (p. 403).

Defined as such, discharge planning is aimed at providing continuity of care. Moreover, it is believed that discharge planning can reduce the rate of geriatric readmission for recurrences of previously treated medical conditions (Shine, 1983), and expedite patient discharge (Marchette and Holloman, 1986).

Yet geriatric readmission to acute care hospitals cannot be avoided solely through discharge planning. Geriatric readmission is a complex problem which warrants considerable concern and better understanding by health care administrators, planners, and policy makers. An early study conducted by Brocklehurst and Shergold (1968) demonstrated a geriatric readmission rate of 26 percent, the majority of which occurred following a home discharge. More recently, Andrews (1986) studied the relevance of elderly readmissions. Employing a study population whose mean age was 80.1 years, Andrews (1986) found that 8 percent were readmitted within three months, the majority of whom were readmitted with a recurrent problem. The author concluded that despite careful discharge planning, a proportion of elderly patients require readmission.

Pressures to reduce health care resource consumption by decreasing lengths of stay therefore, "need to be balanced against the risk of readmission within short periods" (Andrews, 1986, p. 6). Expedient discharge in order to 'free' beds must be weighed against the risk of readmission. Butler (1984) notes that the pressure to expedite elderly discharges often leads to the "easiest discharge plan rather than the best plan" (p. 58).

Appropriate placement of elderly hospital discharges is a key concern because inappropriate levels of care provision are "a potentially harmful and costly situation" (Kane et al., 1983, p. 1055). In spite of serious adverse effects,

many long-term placements from hospital have been judged by independent evaluators as inappropriate (Wachtel et al., 1984; Williams, Hill, Fairbank and Knox, 1973). Subsequent to such mismatching of post-discharge geriatric service requirements, the utility of Geriatric Assessment Units (GAU) has been examined.

Geriatric Assessment Units provide specialized multidisciplinary approaches to geriatric care and strive to develop comprehensive, individualized care regimens. The underlying premise of the GAU is that early assessment of elderly patients and appropriate treatment regimens can minimize dependency, thus improving patient outcomes. To date, little data exists regarding the effectiveness of such units. Williams and associates (1973) studied the appropriateness of patient placements evaluated in a GAU. They reported "significant improvements in the degree of appropriateness of placement in long-term care" (p. 1335), and estimated a 20 to 30 percent improvement over the typically reported experience. A more recent conflicting finding is reported by Teasdale and associates (1983) who conducted a comparison of patient placement outcomes between geriatric cohorts receiving care in a GAU and those receiving care on general medicine floors. The authors observed no difference in patient placement outcomes between the two groups. In view of the lack of conclusive evidence, the GAU remains of dubious value in improving geriatric patient outcomes or discharge status.

From a systems perspective, the discharge status of elderly patients from acute care hospitals is of considerable importance in delineating the utilization of the various components of the health system. As a result, patterns of elderly discharge from hospitals have been the subject of some current studies. To date however, placement in nursing homes has received the most attention although the use of community services and home discharges have also been discussed.

It has been stated that as many as 40 percent of the elderly will enter a nursing home at some point in their lives (Kane et al., 1983). Since acute care hospitals are a major source of nursing home referral, examination of hospital discharge patterns can provide useful information regarding health resource utilization. An initial study conducted by Brocklehurst and Shergold (1968) indicated that 11 percent of geriatric patients discharged from hospital were admitted to another hospital or nursing home. Similarly, Kane and associates (1983) reported that 9 percent of hospital discharges were admitted to nursing homes. Further, the authors provided information regarding the typical nursing home patient profile. Those patients 85 years and older were ten times as likely to enter a nursing home as those 65 years old. Females are twice as likely to be placed in a nursing home as are males. Diagnoses of mental illness were associated with a greater predisposition to nursing home placement than were diagnoses of physical

illness alone, and the presence of both types of diagnoses had an additive effect toward placement. In affirmation of the previous research, Meiners and Coffey (1985) conclude that discharges to nursing homes fall more frequently into "diagnostic categories that require skilled rehabilitative services, that reflect mental or behavioral problems, or that specifically reflect frailty of old age" (p. 380).

Hospital resource consumption as measured by LOS has also been reviewed. Elderly discharges to nursing homes have been associated with a significantly longer LOS, whereas home discharges had the shortest LOS (Kane et al., 1983; Marchette & Holloman, 1986). The longer LOS of nursing home placements are presumably linked to transfer arrangements. In a study of community service use, Victor and Vetter (1985) found a positive relationship between hospital LOS and post-discharge use of community services, thereby suggesting some link between levels of morbidity and service use. Discharges to home care agencies often comprise elderly in diagnostic categories requiring long term management who do not necessarily have debilitating conditions (Meiners and Coffey, 1985).

Discharge patterns have also been associated with admission sources. Lewis and associates (1985) outline the "ping-pong" pattern of patient transfers between nursing homes and hospitals (p. 387). The authors report that of those patients admitted to hospital from a nursing home, 80 percent repeat a nursing home discharge. Similarly, elderly

patients admitted to hospital from home tend to be discharged home (Kane et al., 1983). Apparently the source of admission is a good predictor of discharge status.

2.5.3 Summary

Fiscal restraint and the expectation of augmented demands upon the hospital sector by the elderly have drawn attention to the discharge status of geriatric patients. Determinants of discharge status are under study to facilitate appropriate discharge planning and intervention. Improved understanding of geriatric discharge status decisions can enhance health resource use by delineating the interreliance of various components of the health system.

2.6 Summary of the Literature Review

The foregoing literature review indicated that:

1. Several models of utilization and theoretical concepts exist to explain health service utilization. To date, research in this area remains exploratory and descriptive and, as such, well defined theories of health service utilization, particularly with regard to the elderly, are newly emerging. Most of the literature, however, incorporates the concepts of need, demand and utilization, though only actual utilization can be measured in health services research.
2. Increasing interest in health service utilization has led to the study of a variety of determinants which

affect utilization. In general, such determinants can be grouped into individual, societal and health system factors. As the exact influence of each is unclear (due to the difficulty of separating their effects), it appears that the systems perspective, which recognizes the inextricable nature of the determinants, best accounts for variation in utilization.

3. Writings related to health service utilization by the elderly suggested that technological imperatives, biophysiological aspects of aging and psychosocial factors greatly influence elderly utilization of services. In combination with the chronicity and multiplicity of diagnoses among the elderly, particularly the old-old, the health status of the elderly population is highly variable. As such, the elderly are conceded to be a heterogeneous group, rendering the study of their physical or functional status of prime importance in determining their utilization of health services.

4. The impact of the aging population upon acute care hospitals was broadly discussed in the literature. Emphasis was placed upon the appropriateness of hospital use by the elderly, a salient health care issue. Accordingly, a variety of related topics were reviewed in the literature, such as long-stay patients, bed-blocking, discharge planning, the adverse effects of hospitalization, and the changing role of the acute care

hospital.

5. Relevant applications of classification methods in the health care field are disease classification, patient classification, and case-mix measures. Separately, disease and patient classification proved too narrow in scope. The case-mix method however, is likely to provide valuable measures of utilization and hospital performance.

6. Individual, societal and health system determinants all contribute to elderly discharge status from acute care hospitals. Despite the paucity of literature in this area, the results of the studies to date concur that physical or functional ability, familial support, case complexity and hospital-specific patterns affect discharge status. Current concerns in this area centre on: 1) expedient discharge, 2) appropriate placement following discharge, and 3) the readmission of geriatric cases.

Chapter 3

METHODOLOGY

As previously outlined, the primary purpose of this study is to explore geriatric acute care hospital utilization patterns according to major diagnostic categories. The research process undertaken to achieve this purpose involved three investigational stages: 1) development of a conceptual base and research strategy, 2) selection and acquisition of data, as well as development of appropriate data files, and 3) formulation and execution of relevant data analysis strategies. A discussion of these three stages of the research methodology is presented in this chapter.

3.1 Conceptual Framework and Research Strategy

Development of the study purpose and objectives provided general direction for the investigational approaches required and the subsequent data analysis steps to be undertaken. The development of a relevant conceptual framework was central to this process.

3.1.1 Conceptual Framework

The study of health services utilization, in general, and acute care hospital utilization, in particular, demands a conceptual framework which provides guidelines for data analyses and a basis for data interpretation. A selective review of the literature, presented in Chapter 2, provides

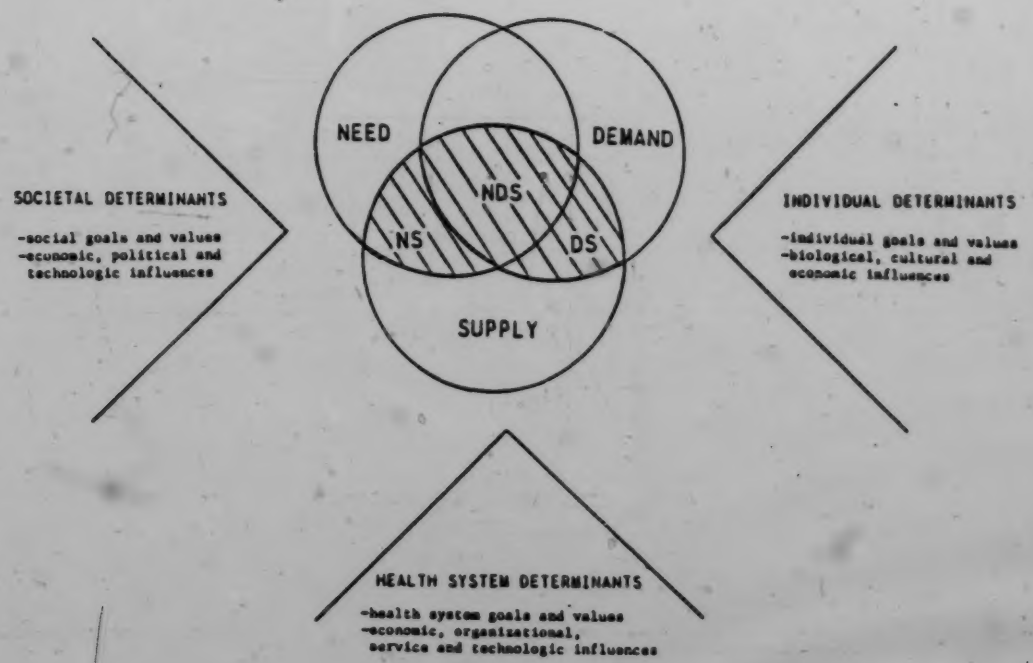
the basis for the development of a conceptual framework. Review of utilization models and determinants of utilization pertaining to the patient population generally, and the elderly patient population specifically, contributed to the conceptualization of the present study and directed the research process to be undertaken. The conceptual model employed in the research is adapted from previous utilization research and is illustrated in Figure 1.

The model is adapted from the utilization studies conducted by Romeril (1984) and Szafran (1985). As demonstrated in the schematic representation of the model in Figure 1, the model incorporates a number of earlier perspectives put forth in the literature. The systems perspective credited to Churchman (1968) is coupled with the social systems perspective of utilization proposed by Anderson (1973), which together identify the various relationships that exist among factors affecting utilization. Emphasis upon aggregate population characteristics such as that of the consumer market view of utilization (Jeffers, Bognanno & Bartlett, 1971) are also integrated into the model. Further, the model borrows from the work of Meyers (1965) who describes the forces at work in the "Health/Medical Care Complex".

The model further attempts to illustrate three major concepts associated with utilization (need, demand and supply) and three levels of determinants of utilization (societal, individual and health system). In outlining these

FIGURE 1

HEALTH SERVICES UTILIZATION BY THE ELDERLY:
A CONCEPTUAL FRAMEWORK[2]



---

[2]Adapted from Romeril, 1984

six concepts pertaining to utilization, the model endeavors to portray: 1) the complexity of the forces which determine utilization, and 2) the dynamic interaction of utilization behaviors which result in actual utilization.

The interaction of need, demand and supply determines actual utilization which is represented in the model by the shaded area. Accordingly, actual utilization reflects three components of the need, demand and supply concept: 1) true needs which are not demanded but served (NS), 2) false needs which are demanded and served (DS), and 3) true needs which are demanded and served (NDS).

In addition, three levels of determinants are depicted in the model. Individual determinants are comprised of individual goals, values and expectations as well as economic, cultural and biological influences. Societal determinants reflect social goals, values and expectations in combination with economic, political and technologic influences. Similarly, health system determinants represent the goals, values and expectations of the health system in general, as well as the economic, technologic, organizational and service influences in particular. Separately or together, these three levels of utilization determinants act as forces which define actual utilization of health services.

In total, the model addresses the key concepts and determinants of actual, not ideal, health care utilization, and as such, lends itself to the study of acute care

hospital utilization by the elderly.

3.1.2 Research Strategy

Subsequent to the development of a conceptual framework, the selection of an appropriate research perspective and method is necessary to achieve the study goal and objectives. Given the scope and objectives of the present research, an exploratory, descriptive, retrospective and cross-sectional approach was undertaken. This approach was deemed to be the most appropriate for numerous reasons which are outlined in the following paragraphs.

The goal and objectives of the research regarding the acute care hospital utilization by the elderly are primarily descriptive in nature. Furthermore, although the literature review presented in Chapter 2 revealed an extensive body of literature regarding health service utilization in general, a paucity of literature and research exists relative to health service utilization by the elderly. Despite limited conceptual advances, researchers fail to agree upon the most appropriate operational referents of utilization (Harel, Noelker & Blake, 1985). As a result, well-defined theories are lacking and descriptive studies prevail in the literature.

In the absence of theoretical foundations inferential research is inappropriate. Further, as the present study examines <u>all</u> elderly separations from acute care hospitals in Alberta over one year, (rather than data obtained through

sampling), inferential research is unnecessary. Consequently, an exploratory, descriptive perspective which involves describing and characterizing elderly hospital utilization is deemed most appropriate.

Since the association between diagnostic category and utilization is a major point of inquiry in this research, the data base must incorporate diagnostic details in conjunction with other variables of interest. Such variables are available in the Professional Activity Study (PAS) data. PAS data provide retrospective data which are relatively accessible and inexpensive. In keeping with the exploratory and descriptive nature of the present study, a cross-sectional design was utilized. Despite the drawbacks of a cross-sectional design which limit applicability of the study findings, for the purposes of this study, this design provided a feasible approach to the research objectives while conforming to cost and time constraints.

The significance of the present research in large part relates to the generation of new information regarding acute care hospital utilization by the elderly, which would contribute to health care planning in Alberta. Since health care planning, in reality, encompasses the broader issue of the allocation of scarce health care resources, health care planners are charged with ensuring the equitable distribution of available health care resources. Accordingly, per capita measures of resource supply and consumption were required because "it is necessary to match

the amount of resources available with the population to be served ..." (Bay and Nestman, 1984, p. 142). Consequently, the research methods employed in this study reflect population-based per capita measures of hospital resource supply and utilization. Furthermore, age-sex adjusted utilization rates were also calculated. In this way the comparability of the elderly's utilization rates between age cohorts was ensured.

In summary, the overall research strategy for this study was to conduct a descriptive study of acute care hospital utilization by the elderly in Alberta according to major diagnostic categories. The strategy included:

1. a cross-sectional analysis employing retrospective data spanning a twelve month period;
2. a population-based approach to utilization rates to address health care resource allocation concerns;
3. age-sex adjusted and diagnostic-specific utilization rates;
4. the delineation of patterns of patient discharge status following acute care hospitalization; and
5. development of an index of diagnostic multiplicity to provide a quantitative measure for analysis of resource utilization.

3.2 Data Sources

The source of data used in any research greatly influences the scope of the study, the reliability and validity of the results, and the general applicability of the findings. To effectively conduct the present research, two data sources were utilized: 1) the Professional Activity Study (PAS) data; and 2) federal census data. Together these data sources were believed to provide the most complete reflection of the Alberta hospital services experience. The relative availability and accessibility of these data sources were not only congruent with the constraints of the current study but also reiterated the usefulness of such data in health care planning efforts.

3.2.1 Professional Activity Study (PAS) Data

The PAS data file is generated by a patient separation abstract system for short-stay hospitals. The PAS data are collected by the Medical Records Departments of participating hospitals and processed by the Commission on Professional and Hospital Activities (CPHA), a non-profit, non-governmental research and education centre in the United States. The Alberta Department of Hospitals and Medical Care provided the computerized separation abstracts for all acute care hospitals in the province from April 1, 1983 to March 31, 1984, the most recent year of data available. Each separation abstract contains patient specific demographic, diagnostic and treatment data. The variables of particular

relevance to this study included: a) age of patient on admission, b) patient gender, c) principal and secondary diagnoses, d) primary operative procedures, e) length of stay, f) admitting hospital code, g) hospital district corresponding to patient residence, and h) discharge status.

Among the major advantages of using PAS data is the comprehensive and objective nature of the data. The PAS data provide a complete province-wide data base which represents Alberta's hospital utilization experience. Furthermore, data objectivity and reliability is fostered through the CPHA's voluntary and non-profit status as well as standardized uniform collection methods used by hospitals.

Disadvantages inherent in the use of PAS data also exist, and result in methodological limitations. The unit of data collection, the hospital separation, represents an episode of hospital stay, not necessarily an illness episode of a patient. Consequently, multiple admissions or institutional transfers of patients may result in a number of separations for the same patient or episode of illness. The use of the separation therefore, can bias utilization rates toward over-representation of the actual cases served. To address this data limitation, patient-days (PDAYS) were employed in addition to separations (SEPS) as a measure of utilization. The use of the PDAY measure is advantageous in that it offers a proxy measure of resource consumption, although the PDAY is not without potential bias. Despite the dynamic and continuous nature of the separation, the PDAY is

accounted to the year in which the patient is separated from the hospital, (regardless of the date of admission), so that theoretically some distortions in the recording of patient days could result. However, because separations occur at random, this limitation was assumed to be of a non-systematic nature and as such, would produce a cancelling-out effect at both ends of the year.

Age Boundaries

The hospital separations of relevance to this study were selected from the PAS files according to age at admission. Defining the parameters of any target population often presents some difficulties and requires some judgement. In keeping with the demographic focus of this study, and the socio-judicial convention of defining 'elderly' as those aged sixty-five or older, this study employed age sixty-five as the lower age limit for the target population. The elderly population was further divided into three age groups: (1) 65-74 years; (2) 75-84 years; and (3) 85 years and older. This subdivision corresponds to the generally accepted classification of the elderly in the literature which categorizes the young-old, the old, and the old-old (or very old) respectively.

Diagnostic Classification

Patient diagnosis is the focal point in the physician-patient relationship. Since the diagnosis "establishes the relevant technology of care and, hence, the types and levels of resources required ...", it is considered "fundamental to measurement of hospital output" (Hornbrook, 1982, p. 74), and is expected to relate to resource consumption (Doremus & Michenzi, 1983; Lave & Leinhardt, 1976).

For the purposes of this study, diagnostic classification was based upon the ICD-9-CM coding methodology. The ICD-9-CM contains 18 broad categories representing diseases, signs, symptoms and ill-defined conditions; in addition to 15 major categories of surgical procedures. These categories are listed in Table 1. Due to the exploratory, descriptive nature of this study, the emphasis on diagnostic multiplicity, and the goal toward enhanced health care planning, these broad diagnostic categories were employed although finer diagnostic divisions are available. Due to their inapplicability, the two diagnostic categories relating to pregnancy and childbirth were omitted.

Although diagnosis is recognized as a central component in the measurement of hospital output, the incorporation of a diagnostic classification unit is beset with difficulties. Among these are: a) coding reliability and validity, b) classification unit representativeness, c) validity as

TABLE 1

DIAGNOSTIC AND OPERATIVE CATEGORIES

DIAGNOSTIC CATEGORIES	Infectious and Parasitic Diseases
	Neoplasms
	Endocrine, Nutritional and Metabolic Diseases
	Diseases of the Blood and Blood-Forming Organs
	Mental Disorders
	Diseases of the Nervous System and Sense Organs
	Diseases of the Circulatory System
	Diseases of the Respiratory System
	Diseases of the Digestive System
	Diseases of the Genitourinary System
	Diseases of the Skin and Subcutaneous Tissue
	Diseases of the Musculoskeletal System and Connective Tissue
	Congenital Anomalies
	Symptoms, Signs and Ill-Defined Conditions
	Injury and Poisonings
	Supplementary Classifications
OPERATIVE CATEGORIES	Operations of the Nervous System
	Operations of the Endocrine System
	Operations of the Eye
	Operations of the Ear
	Operations of the Nose, Mouth and Pharynx
	Operations of the Respiratory System
	Operations of the Cardiovascular System
	Operations of the Hemic and Lymphatic System
	Operations of the Digestive System
	Operations of the Urinary System
	Operations of the Male Genital Organs
	Operations of the Female Genital Organs
	Operations of the Musculoskeletal System
	Operations of the Integumentary System
	Miscellaneous Diagnostic Therapies and Procedures

resource indicator, and d) inability to measure severity of illness.

Reliability and validity of diagnostic coding is beyond the control of the researcher. While some assurance is gained through the data quality checks of the CPHA, recent studies indicate some concern regarding the imprecision of diagnostic coding (Roos, Roos, Cageorge, & Nicol, 1982). Researchers have reported variation in diagnostic reliability among medical conditions, whereas surgical procedures were found to be less ambiguous events. Yet even in recognition of these coding inaccuracies, the PAS data represent the best available data source.

The representativeness of the classification unit, the major diagnostic classes of the ICD-9-CM, is also of concern. The aim of any diagnostic classification system is to optimize within group homogeneity and maximize between group heterogeneity. The proposed classes of major diagnoses used in this study attempted to achieve this goal by being broad enough to include all diagnostic possibilities while distinguishing among service requirements, yet specific enough to encompass relatively homogeneous patient types with regard to resource requirements.

The validity of the diagnostic unit as an indicator of resource requirement is another concern. Many factors within and external to the diagnostic unit affect resource utilization. Yet, cognizant of the inherent variability even within a diagnosis, Lave and Leinhardt (1976) contend that

diagnoses remain relevant to understanding the cost and length of a hospital stay. In support of this contention, Doremus and Michenzi (1983) suggest that multiple diagnoses can often complicate a hospital stay or contribute to case severity which ultimately translates into greater resource requirements.

Increasing interest in the development of measures of health status have directed attention toward severity of illness. However, attempts to derive additive values of severity, through diagnostic classification in particular, have been dismissed as inappropriate by Krischer (1976). Although the diagnostic unit does not provide a direct measure of severity of illness, diagnoses do provide some indication of the clinical requirements and related resource needs of patients.

Geographic Unit of Analysis

Comparison of utilization patterns in Alberta requires the division of the province into mutually exclusive and exhaustive geographic units. Although several systems for geographic subdivision exist, previous utilization studies conducted in Alberta have deemed the "General Hospital District" (GHD) to be the most appropriate geographic unit of analysis (illustrated in Figure 2). The rationale for using the GHD is based on the following factors: 1) Canadian census enumeration areas (EAs) can be compiled to approximate district boundaries; 2) the hospital district is recorded as the patient origin on the PAS separation

FIGURE 2

Configuration of General Hospital Districts in Alberta

. General Hospital
() Multiple Hospital Facilities in One Centre

abstract; and 3) only 8 of the 103 hospital districts contain more than one hospital. Hospital districts containing more than one hospital (number of hospitals in brackets) include: Beaverlodge-Hythe (2), Flagstaff-Hughenden (4), Lamont-Mundare-Willington (3), Lethbridge (3), Bonnyville (2), Metro-Calgary (6), Fort Vermilion (2), and Metro-Edmonton (6).

3.2.2 Census Data

In order to calculate per capita hospital utilization rates, the number of persons in each hospital district is required. The federal census data provide such data. Statistics Canada tabulates census data according to enumeration areas (EAs) which typically do not cross geographic boundaries. The compilation of EAs into hospital districts is facilitated by the provincial government, which employs an allocation methodology specifying that EAs cannot be divided among hospital districts and that EAs are allocated entirely into one hospital district. This tabulation of the census data, into 103 hospital districts according to gender and 5-year age groupings, is available through the provincial government for the 1981 census year.

Whereas the PAS data represent dynamic, continuous observations, the census data represent a static, cross-sectional observation at a particular time. Yet, they represent the most accurate estimate available of the population enumeration. Although it is recognized that the

census data may underestimate the population by as much as 5 percent, such underestimates represent random, unavoidable errors. Therefore, systematic distortions of the data are unexpected.

Census Data Modifications

Owing to the general economic decline in Alberta since 1981, population stability among the elderly was assumed. Therefore, despite the seemingly incongruent nature of the cross-sectional census data of 1981 and the continuous PAS data of 1983-84, population based rates of utilization were tabulated using these data. Further, to account for age and gender distribution variation across the population, the census data were age-sex adjusted (Bay & Nestman, 1984; Mausner & Bahn, 1974).

3.3 Data Analysis Strategies

In keeping with the stated objectives of the present study, the following set of data analysis strategies were employed: 1) provincial analysis of general and diagnostic-specific elderly acute care hospital utilization patterns; 2) discharge status analysis; 3) development of diagnostic indices; and 4) multiple regression analyses.

3.3.1 Provincial Analysis

To provide an overall perspective of geriatric hospital utilization in the total health system contained within Alberta, three measures of hospital utilization were

examined. These included: total separations (SEPS), total patient days (PDAYS) and average length of stay (ALOS). These raw measures were examined for each major diagnostic category, and for all major diagnostic categories combined. Aggregation of these utilization data (total SEPS, total PDAYS, and ALOS) were carried out over all hospitals and all hospital districts in the province of Alberta. Provincial utilization rates were calculated by using provincial age-sex adjusted census population figures in the denominator, and total provincial SEPS or PDAYS in the numerator.

3.3.2 Discharge Destination Analysis

An overall perspective of geriatric discharge status from acute care hospitals in Alberta was provided through the employment of a discharge status analysis. As such, examination of the following discharge status was undertaken:

1. discharged with approval,
2. discharged contrary to advice,
3. transferred to hospital,
4. transferred to auxiliary hospital,
5. transferred to mental hospital,
6. transferred to nursing home,
7. discharged with home care, and
8. died.

Through the use of utilization data previously described in

the provincial analysis, the intent of the discharge analysis was to describe and compare elderly discharge patterns relative to diagnostic and non-diagnostic factors. Diagnostic-specific patterns of utilization were examined to detect an association between patient diagnoses and discharge status.

3.3.3 Development of Diagnostic Index

In order to fulfill the third objective of this study, that is, to explore the relationship between diagnoses (particularly diagnostic multiplicity) and resource consumption, the development of indices which related diagnoses with hospital resource use was essential. In the absence of a direct measure of resource use, LOS was employed as a proxy. As such, an index of diagnostic multiplicity was developed to incorporate hospital resource use as measured by LOS. Relative average lengths of stay (RALOSs) which reflected LOSs for specific diagnostic combinations relative to the overall elderly ALOS were calculated as follows:

(ALOS x 100) / Overall elderly ALOS = RALOS

Since the employment of a diagnostic standard was necessary to facilitate the interpretation of the diagnostic complexity index, the primary uncomplicated circulatory diagnoses (that is, without secondary diagnoses or operative procedures) was selected on two accounts. Firstly, circulatory diagnoses accounted for the largest proportion

of elderly hospital utilization and consequently, represented the greatest volume of geriatric cases. Secondly, because the standard was based on a large data base having many diagnostic and surgical categories, systematic bias in the standard was unexpected as all other factors would average out across diagnostic categories. Thus, the resource utilization of this particular group, as measured by LOS, was assumed to have an index value of 1.00. As such, diagnostic-specific resource utilization was measured by LOS relative to this study standard.

With a diagnostic standard so defined, three diagnostic indices were developed. These consisted of:

1. medical indices which were based on primary and secondary diagnostic combinations,
2. surgical indices which were based on primary diagnostic and surgical procedure combinations, and
3. medical-surgical indices which were based on the interaction of diagnoses and surgical procedures combined.

The numeric values for these indices were calculated by dividing each specific Relative Average Length of Stay (RALOS) by the RALOS of the study standard. Specifically, each medical and surgical RALOS was divided by 72.9 and 76.7 respectively (Tables A.1, B.1). The resulting quotients provided the diagnostic complexity measures (DCMs) utilized in this study. In order to assess the impact of diagnostic multiplicity on LOS, the products of the medical and

surgical DCMs were computed. As such, the DCMs delineated the impact of specific diagnostic combinations on LOS, relative to the standard defined in this research.

3.3.4 Regression Analyses

A multiple regression model was employed to assess the explanatory value of the diagnostic indices previously developed, as well as to estimate the effects of other non-diagnostic variables. In this way, quantification of the relationship between; 1) diagnostic multiplicity, 2) non-diagnostic factors, and 3) hospital resource consumption as measured by LOS, was explored.

Certain modifications to the dependent and independent variables were required to facilitate the analyses and optimize the interpretability of the results. In recognition of the known skewed exponential distribution of hospital LOSs, for example, non-linear transformations of the dependent variable (LOS) were used. As such, the log of LOS and the square root of LOS were used to reduce the effects of extreme values in LOS.

According to the literature review, a number of factors influenced [illegible]ly consumption of acute care hospital services. Within the constraints imposed upon this research, however, only the influence of the independent variables listed in Table 2 was investigated. All of the non-diagnostic independent variables were coded as dummy variables. That is, a numerical score was assigned to each

TABLE 2

INDEPENDENT VARIABLES FOR REGRESSION ANALYSES

VARIABLE NAME	DESCRIPTION	SCALE
MDCI	Primary and Secondary Diagnoses	Relative to Study Standard
SDCI	Primary Diagnosis and Surgical Procedure	Relative to Study Standard
MSDCI	Primary, Secondary Diagnoses and Surgical Procedure	MDCI x SDCI
OLD2	Age Group: 75 to 85 years	Yes=1 Other=0
OLD3	Age Group: 85+ years	Yes=1 Other=0
SEX	Male	Yes=1 Other=0
DCLASS1	Patient Origin: Rural District	Yes=1 Other=0
DCLASS2	Patient Origin: Suburban District	Yes=1 Other=0
HCLASS1	Primary Hospital Type	Yes=1 Other=0
HCLASS2	Secondary Hospital Type	Yes=1 Other=0
ACODE	Accident Related Diagnoses	Yes=1 Other=0
INST	Institutionalized Following Hospitalization	Yes=1 Other=0
DEAD	Discharged Deceased	Yes=1 Other=0

case based on the appropriate category for that case. For the variables age, patient origin and hospital type it was necessary to exclude one of the indicator variables in each regression analyses, since the inclusion of an indicator variable for all components of the variable would have resulted in linear dependency and multicollinearity. As a result, the reference categories for each of these variables were: 1) Age: young-old (65 to 74 years), 2) Patient Origin: metro districts, and 3) Hospital Type: tertiary hospitals.

3.4 Methodological Summary

The methodology used to explore acute care hospital utilization by the elderly was founded upon a descriptive, exploratory perspective. Retrospective data were employed in a cross-sectional design to examine population-based measures of utilization. The data required to conduct the study included: PAS data for 1983-84, and federal census data for 1981. These data were pre-existing and available through the Department of Hospitals and Medical Care. File modifications were undertaken on the basis of the current study focus.

The proposed data analysis strategies encompassed a number of investigational objectives. Consequently, four data analysis strategies were discussed including: 1) assessment of overall provincial utilization patterns and rates, 2) examination of discharge status patterns, 3) development of diagnostic indices, and 4) regression

analyses.

Chapter 4

RESULTS

In keeping with the stated objectives and analytic strategies of the study, the research findings are presented in this chapter. Accordingly, the results are discussed relative to: 1) provincial analysis of general and diagnostic-specific elderly acute care hospital utilization patterns; 2) discharge status analysis; and 3) diagnostic multiplicity analysis.

4.1 Provincial Profile

To maintain a systems perspective, relevant aspects of census data and provincial annual reports were examined in relation to general demographic and health care delivery system characteristics. Such information was intended to describe the hospital system and population in general, thus establishing the background against which acute care hospital utilization by the elderly occurred.

4.1.1 The Hospital System In Alberta

Hospital districts divide the province into 103 mutually exclusive and exhaustive geographic areas (Figure 2). These hospital districts vary significantly with respect to geographical size, environmental and population characteristics, available means of transportation and hospital size, type and location. As such, these dissimilarities among hospital districts were expected to

influence patterns of utilization twofold. Firstly, as suggested in the literature, geographical configuration would influence the travel time to a hospital. Secondly, differing hospital district population densities may affect the availability of health care resources, thereby resulting in disparate utilization patterns.

The distribution of general acute care hospitals within hospital districts is generally one hospital per hospital district. Districts having more than one hospital include: both metropolitan districts (Metro-Calgary and Metro-Edmonton), one regional district (Lethbridge), and six rural districts (Beaverlodge-Hythe, Bonnyville, Cold Lake, Flagstaff-Hughenden, Fort Vermilion, and Lamont-Mundare-Willingdon). Two hospital districts (Blood Indian Reserve and County of Wheatland) have no hospital.

The Alberta hospital system encompassed 123 public general hospitals in 1983, some of which included long-term care beds. For the 1982-83 fiscal year, 13 of these hospitals operated long-term beds while at the end of the 1983-84 fiscal year, 2 more hospitals operated long-term care beds. In addition, 2 federal general hospitals were in operation. Altogether, the total hospital bed capacity of all public and federal general hospitals, excluding long-term beds, equalled 12,238 beds for adults and children.

As indicated in the literature, hospital bed supply is an important determinant of hospital utilization. Among the

elderly, in particular, bed supply throughout the health care delivery system is closely linked to the utilization of various *types-of-care*. Thus, considering the elderly are occasionally charged with overuse and misuse of acute care hospitals, both hospital and long-term bed supply warrant discussion.

In general, the 1983 bed supply in Alberta is summarized in Table 3. Acute care bed capacity totalled 12,238 with a per capita rate of 5.2 beds per 1000 persons. The rated bed capacity for long-term care increased to 4,519 beds, thus maintaining the previous year's per capita long-term bed supply at 1.9 beds per 1000 persons. At the same time, the number of nursing home beds rose 3.4 percent from the previous year to a total of 7,590 beds, thereby increasing the number of nursing home beds to 42.6 beds per 1000 elderly. Although the long-term care and nursing home bed capacity had risen to its highest level by 1983, acute care bed supply had diminished. In comparison with the previous year, however, the bed supply per 1000 persons remained constant for both acute and long-term care and rose slightly for nursing home care. Although the actual supply of acute care, long-term care and nursing home beds increased by 1984, per capita bed supply remained relatively constant with a slight increase in long-term care.

In summary, the statistics on Alberta's bed supply indicated that while the actual numbers of long-term care and nursing home beds consistently increased from 1979 to

TABLE 3

SUPPLY OF ACUTE CARE, LONG-TERM CARE, AND NURSING HOME BED SUPPLY IN ALBERTA: 1979 - 1984

YEAR	TOTAL BED SUPPLY*			PER CAPITA BED SUPPLY		
	ACUTE CARE*	LONG-TERM CARE	NURSING HOME	ACUTE CARE**	LONG-TERM CARE***	NURSING HOME****
1979	12038	3668	7132	5.8	1.8	45.2
1980	12079	3903	7255	5.6	1.8	44.2
1981	12345	4213	7286	5.4	1.8	43.1
1982	12285	4399	7340	5.2	1.9	41.7
1983	12238	4519	7590	5.2	1.9	42.6
1984	12324	4740	7694	5.2	2.0	42.6

* The total yearly number of general hospital beds in Alberta approved either by the Provincial or Federal Government as reported in the Annual Report.
** Given as the number of acute care beds per 1000 persons.
(Total acute care rated bed capacity x 1000) / Alberta's population as given in the Annual Report.
*** Given as the number of long-term care beds per 1000 persons.
(Rated Auxiliary hospital beds + rated long-term care beds in general hospitals x 1000) / Alberta's population.
**** Given as the number of nursing home beds per 1000 elderly persons.
(Total rated bed capacity of Nursing Homes x 1000) / Alberta's population 65 years and over.

Source: Alberta Hospitals & Medical Care Annual Reports 1979/80 to 1984/85.

1984, the acute care bed supply fluctuated. Further, per capita rates demonstrated a marginal increase in long-term care beds and a slight reduction in acute care beds. At the same time, the foregoing statistics indicated a U shaped supply of nursing home beds. In the absence of defined per capita target rates for bed supply, these statistics were difficult to interpret. Yet, it appeared that with regard to the elderly, in particular, although the actual supply of long-term care and nursing home beds increased considerably, these increases were not in proportion to population increases.

4.1.2 Population Description

The 1981 census reported that between 1976 and 1981 Canada's population as a whole increased by 5.9 percent to 24.3 million while during this same period the elderly population increased by 17.9 percent to 2.4 million (Table 4). Whereas at the national level the elderly represented 9.7 percent of the total population, in Alberta they accounted for 7.3 percent. Relative to the Canadian average, Alberta was a 'young' province. Nevertheless, due to its profound influence on patterns of resource consumption and policy decisions, the population's aging trend was a significant characteristic of the 1981 census (Clarke, 1985).

In terms of the utilization of hospital services, Statistics Canada's report (Hospital Morbidity, 1984)

TABLE 4

POPULATION OF ALBERTA AND CANADA IN 1981 (IN THOUSANDS)

SEX & AGE	ALBERTA	%	CANADA	%
Both sexes:				
Non-Elderly (< 65 years)	2074.3	92.7	21982.2	90.3
Elderly				
65 - 69	57.4	2.6	844.3	3.5
70 - 74	43.1	1.9	633.4	2.6
75 - 79	30.7	1.4	432.7	1.8
80 - 84	17.9	0.8	256.8	1.1
85+	14.2	0.6	193.8	0.8
Total Elderly	163.4	7.3	2361.0	9.7
Total Population	2237.7	100.0	24343.2	100.0

TABLE 4A

DISTRIBUTION OF ELDERLY BY AGE AND SEX, ALBERTA AND CANADA 1981

Elderly Males				
65 - 69	27.0	16.5	390.6	16.5
70 - 74	20.1	12.3	281.2	11.9
75 - 79	14.2	8.7	180.5	7.6
80 - 84	7.5	4.6	94.9	4.0
85+	5.5	3.4	63.6	2.7
Total Elderly Males	74.2	45.4	1010.9	42.8
Elderly Females				
65 - 69	30.4	18.6	453.8	19.2
70 - 74	23.1	14.1	352.2	14.9
75 - 79	16.5	10.1	252.2	10.7
80 - 84	10.4	6.4	161.9	6.9
85+	8.7	5.3	130.2	5.5
Total Elderly Females	89.2	54.6	1350.1	57.2
Total Elderly	163.4	100.0	2361.0	100.0

indicated that in 1980-81 the elderly accounted for 22 percent of hospitalizations and 48 percent of all patient-days. Moreover, it was noted that elderly female utilization exceeded that of elderly males both in terms of total hospital separations and total patient-days. The 1983-84 Alberta experience, however, demonstrated significantly different results, as presented in Table 5. The elderly accounted for 18.3 percent of all hospitalizations and 27.8 percent of all patient-days, much less than the respective Canadian figures. In view of the foregoing reports and in an effort to uncover more complex patterns of hospital utilization by the elderly, an overall provincial analysis was deemed essential.

4.2 Provincial Utilization By The Elderly

A cross-sectional and comparative analysis was performed to provide a general overview of the volume and patterns of acute care hospital utilization by the elderly. This analysis encompassed three measures of utilization including: total separations (SEPS), total patient-days (PDAYS), and average length of stay (ALOS). To identify diagnostic-specific patterns of geriatric utilization, these raw measures were examined relative to major diagnostic categories. Further, provincial utilization rates were calculated using age-sex adjusted census population figures.

In contrast with the national figures, the elderly in Alberta accounted for 18.3 percent of the total 404.7

TABLE 5

UTILIZATION OF HOSPITAL SERVICES ACCORDING TO AGE AND SEX (IN THOUSANDS)

AGE & SEX	ALBERTA POPULATION 1981	%	SEPS	%	PDAYS	%	SEPRATE	PDAYRATE
NON-ELDERLY:								
Both Sexes	2074.3	92.7	330.6	81.7	2342.1	72.2	0.16	1.13
ELDERLY:								
Males								
65 - 74	47.1	2.1	19.0	4.7	206.6	6.4	0.40	4.39
75 - 84	21.7	1.0	13.7	3.4	169.6	5.2	0.63	7.82
85+	5.5	0.2	4.5	1.1	62.6	1.9	0.81	11.34
Total Elderly Males	74.2	3.3	37.1	9.2	438.7	13.5	0.50	5.91
Females								
65 - 74	53.5	2.4	17.2	4.2	193.1	6.0	0.32	3.61
75 - 84	27.0	1.2	14.0	3.5	182.8	5.6	0.52	6.77
85+	8.7	0.4	5.7	1.4	85.1	2.6	0.66	9.82
Total Elderly Females	89.1	4.0	36.9	9.1	461.0	14.2	0.41	5.17
Both Sexes	163.4	7.3	74.1	18.3	899.7	27.8	0.45	5.51
PROVINCIAL TOTAL	2237.7	100.0	404.7	100.0	3241.8	100.0	0.18	1.45

Note: Population data reflects 1981 census data.
Utilization data reflects 1983-84 Alberta experience.

thousand hospital separations during 1983-84, while accounting for 27.8 percent of the total 3.2 million patient-days. The magnitude of the difference between the national and the Alberta experience can be partially explained by the parameters of this study which, unlike Statistics Canada's study, exclude auxiliary hospital cases and cases having a LOS greater than 121 days. Coupled with the relatively younger population of Alberta, it was not surprising that the Alberta figures were markedly lower than the overall national figures. Elderly ALOSs in Alberta were one and one half times greater than those of the total Alberta population at 12.1 days compared to 7.9 days per separation. As illustrated in Table 5, this difference was also noted in the separation rates (SEPRATEs) and the patient-day rates (PDAYRATEs), with the elderly having rates of 0.45 and 5.51 per person year, almost three and five times greater respectively, than those of the non-elderly. Clearly, both on a percentage and per capita basis, the elderly consumed a substantial proportion of Alberta's acute care hospital resources in comparison to the non-elderly group.

4.2.1 Age and Gender

Despite Statistics Canada's suggestion that as a whole, the elderly female group used more hospital services than the elderly male group, per capita estimation in Alberta indicated the reverse. As presented in Table 6, elderly

TABLE 6

ELDERLY UTILIZATION OF HOSPITAL SERVICES ACCORDING TO AGE AND SEX (IN THOUSANDS)

AGE & SEX	ALBERTA POPULATION 1981	%	SEPS	%	PDAYS	%	ALOS	SEPRATE	PDAYRATE
ELDERLY:									
Males									
65 - 74	47.1	28.8	19.0	25.6	206.6	23.0	10.9	0.40	4.39
75 - 84	21.7	13.3	13.7	18.5	169.6	18.8	12.4	0.63	7.82
85+	5.5	3.4	4.5	6.1	62.6	7.0	13.9	0.81	11.34
Total Elderly Males	74.2	45.4	37.1	50.2	438.7	48.8	11.8	0.50	5.91
Females									
65 - 74	53.5	32.7	17.2	23.2	193.1	21.5	11.2	0.32	3.61
75 - 84	27.0	16.5	14.0	18.9	182.8	20.3	13.0	0.52	6.77
85+	8.7	5.3	5.7	7.7	85.1	9.5	14.9	0.66	9.82
Total Elderly Females	89.1	54.6	36.9	49.8	461.0	51.2	12.5	0.41	5.17
Total Elderly	163.4	100.0	74.1	100.0	899.7	100.0	12.1	0.45	5.51
Both Sexes									
65 - 74	100.5	61.5	36.1	48.8	399.7	44.4	11.1	0.36	3.98
75 - 84	48.7	29.8	27.7	37.4	352.4	39.2	12.7	0.57	7.24
85+	14.2	8.7	10.2	13.8	147.6	16.4	14.5	0.72	10.41
Total Elderly	163.4	100.0	74.1	100.0	899.7	100.0	12.1	0.45	5.51

Note: Population data reflects 1981 census data.
Utilization data reflects 1983-84 Alberta experience.

males demonstrated a SEPRATE of .50 per person-year and a PDAYRATE of 5.91 per person-year in comparison to elderly females whose rates equalled .41 and 5.17 per person-year, respectively. Though elderly males accounted for a greater proportion of SEPS than did elderly females, 50.2 percent versus 49.8 percent, elderly females accounted for the greater proportion of PDAYS. A total of 461 thousand (or 51.2 percent) PDAYS were attributed to elderly females compared to 438.7 thousand (or 48.8 percent) to elderly males. This seeming contradiction was due to the respective ALOSs of 11.8 and 12.5 days for elderly males and females, respectively, which inflated actual female utilization as measured by PDAYS.

Age-specific utilization patterns are also presented in Table 6. Although the young-old group (65 to 74 years) accounted for 48.8 percent (or 36.1 thousand) of all SEPS and 44.4 percent (or 399.7 thousand) of all PDAYS, per capita examination attributed this elderly group with the lowest rates of utilization, at .36 separations and 3.98 days per person-year, respectively. Conversely, the old-old group (85 years and greater) demonstrated the greatest utilization rates, separating from hospitals at a rate of .72 per person-year and accounting for 10.41 PDAYS per person-year. Correspondingly, the old-old demonstrated the greatest ALOS, that of 14.5 days, compared to 11.1 and 12.7 days for the young-old and old groups, respectively. As expected, per capita evaluation of hospital utilization

among elderly age groupings, therefore, indicated substantially greater utilization with advancing age. For example, as compared to the young-old group, the increases in utilization rates by the old and old-old groups were 58.3 and 100 percent, respectively, in terms of the SEPRATE and 81.9 and 161.5 percent, respectively, for the PDAYRATE.

4.2.2 Hospital Type and Patient Origin Analysis

With regard to the type of hospital facility utilized and the origin of the patient, two variables were examined. These were HCLASS which specified a primary, secondary or tertiary facility, and DCLASS which delineated the location of the patient's residence or origin in terms of a rural, suburban or metro hospital district. The findings are presented in Table 7.

In relative terms, 42.3, 23.8 and 33.9 percent of elderly SEPS were generated by primary, secondary and tertiary hospitals, respectively. Due to ALOSs which varied across hospital types, however, the proportion of PDAYS was 36.0, 25.1 and 38.9 percent, respectively. In brief, while primary hospitals generated the greatest proportion of elderly SEPS, tertiary hospitals were associated with the longest ALOS (13.9 days compared to 10.3 and 12.8 days of primary and secondary facilities), and the largest proportion of PDAYS.

Analysis of elderly utilization according to the origin of patients revealed that rural districts accounted for the

TABLE 7

HOSPITAL UTILIZATION ACCORDING TO PATIENT ORIGIN AND HOSPITAL TYPE (IN THOUSANDS)

			PATIENT ORIGIN							
			RURAL	%	SUBURBAN	%	METRO	%	TOTAL	%
HOSPITAL TYPE	PRIMARY	SEPS	28.2	38.1	0.6	0.8	2.6	3.5	31.3	42.3
		PDAYS	289.7	32.2	5.4	0.6	29.0	3.2	324.1	36.0
		ALOS	10.3		9.5		11.2		10.3	
	SECONDARY	SEPS	3.3	4.5	7.0	9.5	7.3	9.8	17.6	23.8
		PDAYS	39.8	4.4	88.0	9.8	98.3	10.9	226.1	25.1
		ALOS	12.0		12.5		13.5		12.8	
	TERTIARY	SEPS	5.5	7.4	0.8	1.1	18.8	25.4	25.1	33.9
		PDAYS	71.6	8.0	10.7	1.2	267.2	29.7	349.6	38.9
		ALOS	13.1		13.8		14.2		13.9	
	TOTAL	SEPS	37.0	50.0	8.4	11.3	28.7	38.7	74.1	100.0
		PDAYS	401.2	44.6	104.1	11.6	394.5	43.8	899.7	100.0
		ALOS	10.8		12.4		13.8		12.2	
		POPULATION	59.66		19.08		84.75		163.49	
		SEPRATE	0.62		0.44		0.34		0.45	
		PDAYRATE	6.72		5.45		4.66		5.50	

Note: Population figures reflect 1981 census data.
Utilization data represent 1983-84 Alberta experience.

greatest proportion of SEPS (37.0 thousand or 50 percent) and PDAYS (401.2 thousand or 44.6 percent), but had the shortest ALOS (10.8 days). Metro districts were associated with the greatest ALOS, that of 13.8 days, and generated a comparable 394.5 thousand or 43.8 percent of all PDAYS. Per capita utilization rates of rural districts exceeded those of suburban and metro districts with SEPRATES of .62, .44 and .34 respectively. Although less frequently admitted to hospitals than rural residents, metro residents had greater ALOSs in hospital. Conversely, rural residents were admitted to hospitals 82 percent more frequently than metro residents but had shorter ALOSs.

In summary, two patterns of hospital utilization emerged. Firstly, rural, suburban and metro elderly residents in Alberta spent, on average, 6.7, 5.4 and 4.7 days respectively in acute care hospitals. Secondly, 36.0, 25.1 and 38.9 percent of the PDAYS associated with these hospitalizations were consumed in primary, secondary and tertiary hospitals, respectively.

4.2.3 Diagnostic-Specific Analysis

Diagnostic-specific hospital utilization by the elderly was examined through the use of major diagnostic categories and the specification of primary and secondary diagnoses as well as primary operative procedures. Discussion of major diagnostic categories focused upon eight leading primary diagnoses which formed the apex of the hierarchical

diagnostic structure in this analysis. Secondary diagnoses and primary operative procedures were examined relative to the leading primary diagnoses. To facilitate clarity of presentation while maintaining a meaningful breakdown, only secondary diagnoses and primary surgical categories having more than 100 cases are presented in the Tables. The remaining cases were combined under the heading of 'Other Secondary Diagnoses or Primary Surgical Procedures'. Accordingly, exploration of diagnostic multiplicity was initiated.

Leading primary diagnoses among the elderly are presented in Table 8. Of the sixteen major diagnostic categories utilized in this study, eight categories accounted for more than 80 percent of all SEPS and PDAYS. Furthermore, circulatory, digestive, respiratory and neoplastic diagnoses combined accounted for more than 55 percent of all elderly SEPS and PDAYS. As leading contributors to elderly hospitalizations, these four leading diagnoses generated SEPRATES of 0.10, 0.06, 0.05 and 0.04 per person-year, respectively, and PDAYRATES of 1.29, 0.60, 0.56 and 0.69 per person-year, respectively. The rank order of the PDAYRATES differed slightly from the SEPRATES with neoplasms ranking second to circulatory diagnoses in terms of PDAYS. This was explained by the ALOS associated with neoplasms, that of 16.1 days, which exceeded all other ALOSs across all diagnostic categories.

TABLE 8

LEADING PRIMARY DIAGNOSES

MAJOR DIAGNOSTIC CATEGORY	SEPS	%	PDAYS	%	ALOS	RALOS	SEPARATE	PDAYRATE	S.D.	S.D./ALOS
Circulatory System	16407	22.2	210210	23.4	12.8	105.5	0.10	1.29	15.2	1.19
Digestive System	9413	12.7	97880	10.9	10.4	85.6	0.06	0.60	11.4	1.09
Respiratory System	8051	10.9	91368	10.2	11.3	93.4	0.05	0.56	12.1	1.06
Neoplasms	7019	9.5	113305	12.6	16.1	132.9	0.04	0.69	16.9	1.04
Injury & Poisonings	5411	7.3	79843	8.9	14.8	121.4	0.03	0.49	17.5	1.19
Genitourinary System	5331	7.2	50535	5.6	9.5	78.0	0.03	0.31	9.6	1.01
Nervous & Sense Organs	4688	6.3	35733	4.0	7.6	62.7	0.03	0.22	9.8	1.29
Musculoskeletal System	4430	6.0	57438	6.4	13.0	106.7	0.03	0.35	12.8	0.99
Other Primary Diagnoses	13305	18.0	163427	18.2	12.3	101.1	0.08	1.00	15.4	1.26
Total	74055	100.0	899739	100.0	12.1	100.0	0.45	5.51	14.2	1.17

Units: SEPS - separations
PDAYS - patient-days
RALOS - ALOS relative to provincial average
SEPRATE - separations per person-year
PDAYRATE - patient-days per person-year
S.D. - standard deviation of LOS

In order to measure specific ALOSs against the overall provincial elderly ALOS, a 'Relative ALOS' (RALOS) was calculated and defined as:

(ALOS x 100) / Overall elderly ALOS = RALOS

In this way, the overall provincial elderly ALOS of 12.1496 days was equated with a RALOS of 100. Hospital stays greater or less than 12.1496 days were thus measured by RALOSs above or below 100 respectively.

Notwithstanding primary circulatory and musculoskeletal diagnoses which accounted for RALOSs of 105.5 and 106.7 respectively, primary diagnoses of neoplasms and injuries or poisonings demonstrated substantially greater RALOSs of 132.9 and 121.4, respectively. These same diagnoses exhibited the largest standard deviations (S.D.s) at 15.2 (circulatory), 12.8 (musculoskeletal), 16.9 (neoplasms) and 17.5 days (injuries or poisonings), respectively, thus indicating a relatively high variability of LOS among patients within each of these diagnostic categories. The coefficient of variation or ratios of S.D. over ALOS suggested that the distribution of LOSs was extremely skewed and represented a pattern of negative exponential distribution.

Secondary diagnoses associated with the leading primary diagnoses are presented in Appendix A, Tables A.1 to A.8. Each table represents a division of the hierarchical diagnostic structure under analysis. For example, Table A.1 can be interpreted as follows. Primary circulatory diagnoses

accounted for 22.2 percent (or 16,407) of all elderly SEPS and 23.4 percent of all elderly PDAYS. The associated ALOS of 12.8 days was slightly greater than the overall provincial ALOS for elderly patients, as indicated by the RALOS of 105.5, and exhibited high variability with a S.D. of 15.2 days. Further, secondary circulatory diagnoses accounted for 46.3 and 45.6 percent of the primary circulatory SEPS and PDAYS, respectively. Similarly, 6.4 percent (or 1053 separations) of all primary circulatory diagnoses were associated with secondary diagnoses involving the endocrine, nutrition and metabolic systems and accounted for 6.3 percent (or 13,178) of the respective PDAYS.

It should also be noted that although secondary diagnoses of the nervous and sense organs accounted for a relatively small proportion of primary circulatory SEPS and PDAYS, 3.4 and 6.0 percent respectively, they resulted in substantially increased ALOSs. Specifically, elderly patients having a primary circulatory diagnosis together with a secondary nervous and sense organ diagnosis stayed 80.5 percent longer, on average, than circulatory patients without a secondary nervous or sense organ diagnosis. This diagnostic combination also generated the highest variability with a S.D. of 26.1 days. In comparison with the 17 percent of primary circulatory SEPS which were without secondary diagnoses and had an ALOS of 8.9 days, all the remaining secondary diagnoses were associated with higher ALOSs. Similarly, Tables B.1 to B.8 in Appendix B present

the same information for primary surgical procedures associated with the leading primary diagnoses.

Examination of the leading primary diagnoses and the associated secondary diagnoses suggested that they were highly inter-related. Specifically, elderly utilization of hospital services tended to centre on one body system. The noted exception, illustrated in Table A.7, was a primary diagnosis of the nervous and sense organs in which the leading secondary diagnoses were of the circulatory system. In this case, secondary circulatory and nervous sense organ diagnoses accounted for 16.1 and 14.6 percent of SEPS, respectively. Across all other leading primary diagnoses, however, the leading secondary diagnosis was of the same diagnostic category as the primary diagnosis.

Though secondary diagnoses encompassed all diagnostic categories, some diagnostic-specific patterns emerged, as evident in Appendix A. In particular, secondary circulatory, endocrine, nutritional and metabolic, respiratory and musculoskeletal diagnoses accounted for some proportion of each of the leading primary diagnoses. Circulatory diagnoses, however, proved to be leading diagnoses ranking no less than second among secondary diagnoses for each of the primary diagnoses, thereby suggesting the prevalence of circulatory diagnoses among elderly patients. Secondary circulatory diagnoses accounted for 7.2 (Table A.4) to 46.3 (Table A.1) percent of all cases within the leading primary diagnoses.

As a measure of diagnostic-specific ALOS relative to the overall provincial elderly ALOS, RALOSs varied greatly among diagnoses. Primary digestive, respiratory, genitourinary and nervous sense organ diagnoses (Tables A.2, A.3, A.6, A.7) generated RALOSs below 100 and were associated with secondary diagnoses whose RALOSs were also generally below 100, indicating the tendency of patients with these diagnoses to have below 'average' LOSs. Further, each of these primary diagnoses generated a large fraction of cases without secondary diagnoses, from 35.5 percent of all primary nervous sense organ diagnoses to 21.2 percent of primary respiratory diagnoses, suggesting that a large percentage of patients in these categories had singular diagnoses.

Similarly, primary circulatory, neoplastic, injury and poisoning, and musculoskeletal diagnoses (Tables A.1, A.4, A.5, A.8) generated RALOSs greater than 100 and, in general, secondary diagnoses of at least the same magnitude. The proportion of primary diagnoses unassociated with secondary diagnoses was slightly smaller than with the foregoing primary diagnoses, ranging from 17 percent of all primary circulatory diagnoses to 27.9 percent of all primary musculoskeletal diagnoses. Although the proportion of cases having no secondary diagnoses varied among the leading primary diagnoses, selected primary diagnoses were substantially more likely to be associated with secondary diagnoses, thus suggesting diagnostic-specific patterns of

diagnostic multiplicity. For example, while 35.5 percent of all primary nervous sense diagnoses lacked secondary diagnoses, only 17 percent of all primary circulatory patients had a singular diagnosis.

Examination of the ALOS of secondary diagnoses in comparison to singular primary diagnoses revealed that, with limited exceptions, those patients with primary and secondary diagnoses had greater ALOSs. The addition of a secondary diagnosis generally led to longer hospital stays for elderly patients. Of particular note are those specific combinations of primary and secondary diagnoses which led to markedly greater ALOSs. Examples of these included: 1) primary circulatory and secondary nervous and sense organ diagnoses (Table A.1) which resulted in an 80 percent increase in ALOS from 12.8 to 23.1 days; 2) primary digestive, neoplastic, and genitourinary diagnoses combined with secondary injury and poisonings diagnoses (Tables A.2, A.4, A.6) which generated 72, 73, and 74 percent increases in ALOS from 10.4 to 17.9 days, from 16.1 to 27.8 days, and from 9.5 to 16.5 days, respectively; and 3) primary nervous sense organ diagnoses and secondary mental disorders (Table A.7) which resulted in a 121 percent increase in ALOS from 7.6 to 16.8 days. Of further note is the fact that each of these diagnostic combinations demonstrated the highest variability in LOS within their respective diagnostic categories, as indicated by S.D.s which exceeded all others in that category. Although highly variable among individual

patients, in general, secondary diagnoses in specific combinations with primary diagnoses, were associated with substantially increased elderly hospital stays.

Utilization measures related to primary surgical procedures are presented in Appendix B, Tables B.1 to B.8. Like secondary diagnoses, primary surgical procedures were inter-related with their respective primary diagnosis, indicating again the tendency of elderly diagnoses and surgeries to centre on one body system. Though miscellaneous diagnostic therapies and procedures represented a leading operative procedure among the primary diagnoses, primary digestive, genitourinary, and nervous and sense organ diagnoses were associated with operative procedures of the same body system (Tables B.2, B.6, B.7). Given that the miscellaneous diagnostic therapies and procedures category included a variety of diagnostic and non-surgical procedures such as soft tissue x-rays, bone marrows and echocardiography, the observed large proportion of such interventions was presumed likely to correspond to the body system of the primary diagnosis. Based on this premise, the miscellaneous therapies and procedures associated with a primary circulatory diagnosis would have included: electrocardiograms, central venous pressure monitoring, artificial pacemaker rate checks and other related cardiac procedures.

Across all of the leading primary diagnoses, primary surgical procedures were present in more than 65 percent of

the respective cases and associated with no less than 73 percent of the respective PDAYS (Tables B.1, B.3). A particularly high proportion of surgical procedures was found among primary nervous and sense, neoplastic and genitourinary diagnoses (Tables B.7, B.4, B.6). Within these diagnoses, 85.3, 87.6 and 90.3 percent of all cases were associated with primary surgical procedures. The greater proportion of surgical intervention among these diagnoses is suggestive of diagnostic-specific patterns of treatment. Even the subtraction of the miscellaneous diagnostic therapies and procedures category from these diagnoses resulted in well over 60 percent of all cases having operative procedures, thus indicating a high rate of surgical intervention among these categories.

Relative to the overall provincial elderly ALOS, the range of RALOS among primary surgical procedures fluctuated greatly. Of note however, were the RALOSs of primary surgical procedures associated with primary circulatory diagnoses which were increased across all surgical procedures. Not only were surgical procedures thus associated with greater hospital stays, but also the variability of individual patient LOSs increased as indicated by the increased S.D.s (Table B.1).

The ALOSs associated with the addition of a primary surgical procedure to a primary diagnosis varied greatly. While the ALOSs of primary circulatory and respiratory diagnoses were generally increased by surgical intervention

(Tables B.1, B.3), the ALOSs of primary digestive, neoplastic, genitourinary, nervous sense organs, and injury and poisonings diagnoses were generally reduced by surgical intervention (Tables B.2, B.4, B.5, B.6, B.7). Unlike secondary diagnoses which increased elderly hospital stays, surgical procedures were often associated with reduced elderly ALOSs.

Particular combinations of primary diagnoses and primary surgical procedures substantially increased or decreased ALOSs. Examples of those which increased ALOSs included: 1) primary circulatory diagnoses combined with a primary musculoskeletal surgical procedure (Table B.1) which resulted in a 131 percent increase in ALOS from 12.8 to 29.6 days; and 2) primary nervous sense organ diagnoses combined with miscellaneous diagnostic therapies and procedures (Table B.7) which generated an 85 percent increase in ALOS from 7.6 to 14.1 days. More common are the following examples of those diagnostic and surgical combinations which were associated with decreased ALOSs: 1) primary digestive, respiratory and neoplastic diagnoses combined with surgical procedures involving the nose, mouth and pharynx (Tables B.2, B.3, B.4) which resulted in 50, 65 and 51 percent decreases in ALOSs from 10.4 to 5.2 days, from 11.3 to 3.9 days, and from 16.1 to 7.8 days, respectively; and 2) primary diagnoses of injury and poisonings combined with a surgical procedure involving the eye (Table B.5) generated a 63 percent decrease in ALOS from 14.8 to 5.4 days. Further,

as indicated by the S.D.s, the reduced ALOSs associated with specific combinations were least variable in terms of individual patient LOSs whereas the increased ALOSs were highly variable. Overall, while some combinations of primary diagnoses and surgical procedures were associated with increased elderly hospital stays, other combinations were associated with reduced hospital stays.

Not all primary diagnoses were associated with operative procedures; some proportion of each were without surgical procedures. For example, as illustrated in Tables B.1 and B.6, while 34.2 percent of primary circulatory diagnoses were unrelated to surgical procedures, only 9.7 percent of genitourinary diagnoses lacked surgical procedures. Moreover, in comparison to the related secondary diagnoses (Appendix A, Tables A.1 and A.6), an inverse relationship was noted between primary surgical procedures and secondary diagnoses which was suggestive of specific treatment modalities, either medical or surgical. This was also noted among other primary diagnoses (Tables A.2/B.2, A.4/B.4, A.6/B.6, A.7/B.7, A.8/B.8) and indicative of a tendency toward medical or surgical approaches for specific diagnoses among the elderly.

4.2.4 Summary of Findings

In summary, the findings of the foregoing provincial analysis for the 1983/1984 fiscal year indicated the following:

1. On a per capita basis, elderly males demonstrated greater rates of hospital utilization than did elderly females, thereby confirming gender-specific patterns of utilization.
2. Age-specific patterns of utilization indicated that greater utilization of hospital services was associated with advancing age.
3. Although tertiary hospitals demonstrated the greatest proportion of utilization, as measured by PDAYS, primary hospitals demonstrated the greatest proportion of separations. On average, elderly patients spent 36.0, 25.1 and 38.9 percent of all PDAYS in primary, secondary and tertiary hospitals, respectively.
4. The rural elderly demonstrated substantially greater per capita rates of utilization than did the elderly originating from other districts. On average, rural, suburban and metro elderly residents in Alberta spent 6.7, 5.4 and 4.7 days per year, respectively, in acute care hospitals.
5. Eight major diagnostic categories accounted for over 80 percent of all elderly SEPS and PDAYS.
6. Among the leading primary diagnoses: (a) circulatory, digestive, respiratory, and neoplastic diagnoses accounted for more than 55 percent of all elderly SEPS and PDAYS; and (b) diagnoses of the circulatory and musculoskeletal systems,, neoplasms and injury or poisonings demonstrated above average and highly

variable LOSs.

7. Diagnostic-specific patterns of utilization revealed that: (a) elderly utilization of hospital services tended to centre on one body system; (b) secondary circulatory diagnoses accounted for a significant proportion of all SEPS and PDAYS among primary diagnoses; (c) secondary diagnoses associated with primary circulatory, neoplastic, injury or poisonings and musculoskeletal related diagnoses demonstrated much greater lengths of stay than other diagnostic categories; (d) secondary diagnoses, particularly in specific combinations, substantially increased elderly LOSs; (e) elderly SEPS were associated with a large percentage of operative procedures which in large part involved miscellaneous diagnostic therapies and procedures; (f) primary nervous and sense, neoplastic and genitourinary diagnoses demonstrated a particularly high rate of operative intervention, even excluding the miscellaneous category; (g) surgical procedures associated with primary circulatory diagnoses demonstrated exceedingly high RALOSs; (h) excluding primary circulatory and respiratory diagnoses, surgical procedures were often associated with reduced elderly hospital stays; and (i) primary diagnoses having a high rate of surgical intervention tended to be less associated with secondary diagnoses.

4.3 Elderly Discharge Status

Current resource constraints have focused attention on many aspects of acute care hospital utilization. From a systems perspective, the discharge status of elderly patients from acute care hospitals is of considerable importance in delineating the impact of specific discharge outcomes on hospital utilization. Since acute care hospitals are a major source of institutional referral, in particular, examination of geriatric discharge patterns provides information with respect to hospital resource utilization. Employing the utilization measures previously discussed, discharge patterns were examined relative to the variables under study.

Though the vast majority of SEPS (76.7 percent) were normal discharges, (that is, discharged home with approval), the remaining 23.3 percent were of particular interest because they accounted for 35.2 percent of all elderly PDAYS (see Table 9). Among these categories of discharge status, transfers to other hospitals accounted for 6.3 percent of SEPS (or 4,677 SEPS) and 7.1 percent of PDAYS (or 63,845 PDAYS), with an ALOS of 13.7 days which was 33 percent greater than that of patients discharged with approval. This is suggestive of a greater requirement for hospital services or a delay in hospital transfers. Transfers to nursing homes and mental hospitals and a discharge status of deceased, which together accounted for 12 percent of SEPS (or 8,868 SEPS) and 18.1 percent of PDAYS (or 162,289 PDAYS),

TABLE 9

HOSPITAL UTILIZATION BROKEN DOWN BY DISCHARGE STATUS

	SEPS	%	PDAYS	%	ALOS	S.D.
DISCHARGED WITH APPROVAL	56833	76.7	583338	64.8	10.3	10.54
CONTRARY TO ADVICE	366	0.5	2970	0.3	8.1	11.77
TRANSFERRED TO HOSPITAL	4677	6.3	63845	7.1	13.7	16.05
TRANSFERRED TO:						
AUXILIARY HOSPITAL	1754	2.4	53228	5.9	30.3	29.74
NURSING HOME	3018	4.1	55521	6.2	18.4	21.01
MENTAL HOSPITAL	1252	1.7	21456	2.4	17.1	18.19
HOME CARE	1557	2.1	34069	3.8	21.9	19.31
DIED (NO AUTOPSY)	4598	6.2	85312	9.5	18.6	22.16
TOTAL	74055	100.0	899739	100.0	12.1	14.23

demonstrated substantially higher ALOSs of 18.4, 17.1 and 18.6 days respectively, representing at least a 66 percent increase in ALOS over those discharged with approval. Further, even greater ALOSs of 30.3 and 21.9 days were associated with transfers to auxiliary hospitals and home care respectively, which in combination accounted for only 4.5 percent of SEPS (or 3,311 SEPS) but 9.7 percent of PDAYS (or 87,297 PDAYS). These latter ALOSs represented increases of 194 and 113 percent, respectively, above those ALOSs of elderly patients discharged with approval, and are indicative of the chronic nature of the illnesses and the back-up of elderly patients awaiting placement in institutions, (particularly auxiliary hospitals), or requiring professional services in the home.

4.3.1 Age Related Differences In Discharge Status

Analysis across elderly age groups was conducted to examine age-specific patterns of discharge status. For the sake of simplicity, discharge categories were combined as follows: 'discharged with approval' and 'contrary to advice' were collapsed into 'discharged with/without approval;' and 'transfers to nursing homes, auxiliary or mental hospitals' were collapsed into 'transferred to institution.'

In general, the old-old (eighty-five years and older) had the longest ALOS, that of 14.5 days compared to 12.7 and 11.1 days for the old (seventy-five to eighty-four years) and young-old (sixty-five to seventy-four years),

respectively. While this remained true for discharges with/without approval, this pattern was not evident across the other discharge statuses. For example, the young-old accounted for the greatest ALOS associated with transfers to institutions and home care; and the old demonstrated the greatest ALOS associated with transfers to hospital or death in hospital. This may suggest differential treatment patterns and discharge outcomes based partially upon age or perhaps simply the consequences of the normal aging process which ultimately leads to expiry.

In addition to increased hospital utilization with advancing age, distinct patterns of discharge status were evident across elderly age groupings. Whereas 84.3 and 75.1 percent of the young-old and old SEPS were discharged with/without approval, only 58.1 percent of the old-old SEPS had this status. As presented in Table 10, transfers to institutions and patient deaths accounted for this large discrepancy. While 21.2 and 11.3 percent of all the old-old SEPS were discharged to institutions or deceased, only 9.3 and 6.7 percent of old and 3.5 and 4.4 percent of young-old SEPS, respectively, shared these discharge outcomes. Overall, the proportion of institutional discharges increased with advancing age. Specifically, discharges to institutions accounted for 21.2 percent of SEPS and 28.8 percent of PDAYS of the old-old versus only 3.5 and 7.4 percent of SEPS and PDAYS, respectively, of the young-old. Similarly, a greater proportion of old-old died in hospital

TABLE 10

HOSPITAL UTILIZATION BROKEN DOWN BY DISCHARGE STATUS AND AGE GROUPINGS

		YOUNG OLD	%	OLD	%	OLD OLD	%	TOTAL	%
DISCHARGED	SEPS	30454	84.3	20822	75.1	5923	58.1	57199	77.2
WITH/WITHOUT	PDAYS	297489	74.4	219447	62.3	69372	47.0	586308	65.2
APPROVAL	ALOS	9.8		10.5		11.7		10.3	
TRANSFERRED	SEPS	2167	6.0	1809	6.5	701	6.9	4677	6.3
TO	PDAYS	28419	7.1	25769	7.3	9657	6.5	63845	7.1
HOSPITAL	ALOS	13.1		14.2		13.8		13.7	
TRANSFERRED	SEPS	1277	3.5	2581	9.3	2166	21.2	6024	8.1
TO	PDAYS	29632	7.4	58066	16.5	42507	28.8	130205	14.5
INSTITUTION	ALOS	23.2		22.5		19.6		21.6	
DIED	SEPS	1582	4.4	1862	6.7	1154	11.3	4598	6.2
NO AUTOPSY	PDAYS	28956	7.2	35543	10.1	20813	14.1	85312	9.5
	ALOS	18.3		19.1		18.0		18.6	
HOME CARE	SEPS	652	1.8	653	2.4	252	2.5	1557	2.1
	PDAYS	15194	3.8	13578	3.9	5297	3.6	34069	3.8
	ALOS	23.3		20.8		21.0		21.9	
TOTAL	SEPS	36132	100.0	27727	100.0	10196	100.0	74055	100.0
	PDAYS	399690	100.0	352403	100.0	147646	100.0	899739	100.0
	ALOS	11.1		12.7		14.5		12.1	
	POPULATION	100545	61.5	48660	29.8	14180	8.7	163385	100.0
	SEPRATE	0.36		0.57		0.72		0.45	
	PDAYRATE	3.98		7.24		10.41		5.51	

(11.3 percent) than did old (6.7 percent) or young-old patients (4.4 percent). In contrast, transfers to other hospitals and to home care indicated relatively similar percentages of SEPS and PDAYS across all age groups, though in absolute terms substantial differences existed. In summary, discharges to institutions or deceased were more common with advanced age, thus lending support to the contention in the literature that the institutionalized elderly of the future will be an older and perhaps sicker population than those of the present.

Elderly patients who were institutionalized following acute care hospitalization accounted for 8.1 percent of all SEPS and 14.5 percent of all PDAYS. The rate of acute care utilization preceeding institutionalization increased across age groupings with the old-old having a SEPRATE of .15 and a PDAYRATE of 3.00 per person year, compared to the respective rates of the young-old of .01 and .29 per person year (see Table 11). Although the old-old demonstrated a general need for more institutionalization, they demonstrated the shortest ALOS for each of the institutional discharges. This can be explained twofold: 1) the majority of old-old who are institutionalized following acute care hospitalization are discharged to nursing homes (versus auxiliary facilities) for which there is a shorter waiting period for placement; and 2) there may be a tendency to priorize placements from hospitals such that the old-old are placed more promptly.

TABLE 11

ACUTE CARE HOSPITAL UTILIZATION PRECEEDING INSTITUTIONALIZATION

		YOUNG OLD	%	OLD	%	OLD OLD	%	TOTAL	%
TRANSFERRED TO AUXILIARY HOSPITAL	SEPS	410	6.8	762	12.6	582	9.7	1754	29.1
	PDAYS	12407	9.5	24200	18.6	16621	12.8	53228	40.9
	ALOS	30.3		31.8		28.6		30.3	
TRANSFERRED TO NURSING HOME	SEPS	503	8.3	1245	20.7	1270	21.1	3018	50.1
	PDAYS	10399	8.0	24258	18.6	20864	16.0	55521	42.6
	ALOS	20.7		19.5		16.4		18.4	
TRANSFERRED TO MENTAL HOSPITAL	SEPS	364	6.0	574	9.5	314	5.2	1252	20.8
	PDAYS	6826	5.2	9608	7.4	5022	3.9	21456	16.5
	ALOS	18.8		16.7		16.0		17.1	
TOTAL	SEPS	1277	21.2	2581	42.8	2166	36.0	6024	100.0
	PDAYS	29632	22.8	58066	44.6	42507	32.6	130205	100.0
	ALOS	23.2		22.5		19.6		21.6	
	POPULATION	100545	61.5	48660	29.8	14180	8.7	163385	100.0
	SEPRATE	0.01		0.05		0.15		0.04	
	PDAYRATE	0.29		1.19		3.00		0.80	

Of all the institutional discharges, transfers to nursing homes accounted for 50.1 and 42.6 percent of the associated SEPS and PDAYS. Transfers to auxiliary hospitals accounted for 29.1 percent of all the institutionalized SEPS, but 40.9 percent of the related PDAYS, with an ALOS of 30.4 days which greatly exceeded the ALOS of the other institutional discharges. Clearly, this provides further evidence of the back-up phenomenon of patients waiting placement in an auxiliary hospital setting.

4.3.2 Accident Related Discharge Status

The presence of an accident diagnosis relative to elderly discharge status was also analyzed. Although only 14 percent of all elderly SEPS had accident diagnoses, they accounted for 21.2 percent of all PDAYS, having an ALOS of 18.3 days compared to the non-accident related ALOS of 11.1 days.

As indicated in Table 12, accident related hospitalizations had consistently greater ALOSs than did non-accident related hospital stays. For example, in terms of discharge status, discharges to home care which were accident related had an ALOS of 30.3 days, 65 percent greater than non-accident related home care discharges, which had an ALOS of 18.3 days. Furthermore, a greater proportion of accident related cases were discharged to hospitals, institutions, home care or had a discharge status of deceased than were non-accident related cases. For

TABLE 12

DISCHARGE STATUS ASSOCIATED WITH ACCIDENTS AMONG THE ELDERLY

ACCIDENT DIAGNOSIS PRESENT:

	SEPS	%	PDAYS	%	ALOS	S.D.
DISCHARGED WITH APPROVAL	6707	64.6	97596	51.3	14.6	14.93
CONTRARY TO ADVICE	35	0.3	414	0.2	11.8	13.80
TRANFERRED TO HOSPITAL	1012	9.7	18021	9.5	17.8	18.43
AUXILIARY HOSPITAL	439	4.2	17279	9.1	39.4	32.71
NURSING HOME	503	4.8	13341	7.0	26.5	25.74
MENTAL HOSPITAL	250	2.4	5339	2.8	21.4	20.86
HOME CARE	465	4.5	14072	7.4	30.3	23.58
DIED (NO AUTOPSY)	974	9.4	24297	12.8	24.9	24.59
TOTAL ACCIDENT CASES	10385	100.0	190359	100.0	18.3	19.72

ACCIDENT DIAGNOSIS ABSENT:

	SEPS	%	PDAYS	%	ALOS	S.D.
DISCHARGED WITH APPROVAL	50126	78.7	485742	68.5	9.7	9.66
CONTRARY TO ADVICE	331	0.5	2556	0.4	7.7	11.49
TRANSFERRED TO HOSPITAL	3665	5.8	45824	6.5	12.5	15.13
AUXILIARY HOSPITAL	1315	2.1	35949	5.1	27.3	28.06
NURSING HOME	2515	4.0	42180	5.9	16.8	19.55
MENTAL HOSPITAL	1002	1.6	16117	2.3	16.1	17.31
HOME CARE	1092	1.7	19997	2.8	18.3	15.89
DIED (NO AUTOPSY)	3624	5.7	61015	8.6	16.8	21.13
TOTAL NON-ACCIDENT CASES	63670	100.0	709380	100.0	11.1	12.83

example, 9.7 percent of all accident related SEPS were transferred to other hospitals, compared to only 5.8 percent of all non-accident SEPS. Similarly, 11.4 percent of all accident related SEPS were transferred to an institutional setting, versus only 7.7 percent of all non-accident related SEPS.

Proportionately, accident related cases demonstrated a distinct pattern of discharge status indicative of a greater requirement for on-going professional intervention through hospital transfer, home care or institutionalization, and a proportionately greater fatality outcome. Moreover, greater variation across individual accident related cases was indicated by S.D.s which were consistently larger than non-accident related cases.

4.3.3 Discharge Status According to Hospital Type and Patient Origin

With the majority of SEPS and PDAYS discharged with/without approval across all hospital types, differences in patterns of discharge were most evident in terms of the remaining discharge statuses. As illustrated in Table 13, with the exception of home care and deceased discharges in which tertiary type hospitals demonstrated the greatest proportion of SEPS (1.5 and 2.5 percent, respectively), and PDAYS (2.8 and 3.9 percent, respectively), primary type hospitals accounted for the largest proportion of discharges to hospitals and institutions. This would appear to be

TABLE 13

ELDERLY DISCHARGE STATUS BROKEN DOWN BY HOSPITAL TYPE

DISCHARGE STATUS

HOSPITAL TYPE		DISCHARGED WITH/WITHOUT APPROVAL	%	TRANSFERRED TO HOSPITAL	%	TRANSFERRED TO INSTITUTION	%	HOME CARE	%	DIED NO AUTOPSY	%	TOTAL	%
PRIMARY HOSPITALS	SEPS	24570	33.2	2498	3.4	2517	3.4	297	0.4	1461	2.0	31343	42.3
	PDAYS	223137	24.8	23683	2.6	46244	5.1	4591	0.5	26399	2.9	324054	36.0
	ALOS	9.1		9.48		18.4		15.46		18.07		10.34	
SECONDARY HOSPITALS	SEPS	13715	18.5	759	1.0	1682	2.3	182	0.2	1287	1.7	17625	23.8
	PDAYS	148922	16.6	12171	1.4	37377	4.2	4087	0.5	23549	2.6	226106	25.1
	ALOS	10.9		16.04		22.2		22.46		18.3		12.83	
TERTIARY HOSPITALS	SEPS	18914	25.5	1420	1.9	1825	2.5	1078	1.5	1850	2.5	25087	33.9
	PDAYS	214249	23.8	27991	3.1	46584	5.2	25391	2.8	35364	3.9	349579	38.9
	ALOS	11.3		19.71		25.5		23.55		19.12		13.93	
TOTAL	SEPS	57199	77.2	4677	6.3	6024	8.1	1557	2.1	4598	6.2	74055	100.0
	PDAYS	586308	65.3	63845	7.1	130205	14.5	34069	3.8	85312	9.5	899739	100.0
	ALOS	10.3		13.65		21.6		21.88		18.55		12.15	

indicative of referrals and transfers to facilities with higher levels of care or long-term care.

As previously established, tertiary hospitals accounted for the longest ALOS of all hospital types and across all discharge statuses. Although tertiary hospitals accounted for a smaller proportion of SEPS across some discharge outcomes, they consistently accounted for the largest proportion of PDAYS. For example, while 53 percent of all discharges to other hospitals were generated from primary type hospitals, 44 percent of all acute care PDAYS which resulted in hospital transfers were generated in tertiary hospitals.

In total, while primary hospitals accounted for the largest proportion of elderly SEPS (42.3 percent), tertiary hospitals demonstrated the longest ALOS across all discharge statuses and thus the greatest proportion of PDAYS (38.9 percent). Once again, the effects of referral to tertiary level care were reflected in the analyses. Furthermore, tertiary hospitals accounted for the largest proportion of deceased and home care discharges, while primary hospitals discharged a larger proportion of SEPS to other hospitals (3.4 percent) and institutions (3.4 percent). Clearly, differing levels of health service delivery and availability were demonstrated in which tertiary hospitals fulfilled a referral role and provided greater access to alternatives such as home care.

Analysis of elderly discharge status according to patient origin revealed specific patterns of discharge for rural, suburban and metro residents. As previously discerned, rural district patients accounted for the greatest proportion of SEPS (50 percent) and PDAYS (44.6 percent), as well as the highest overall per capita rates of utilization with a SEPRATE of .62 and a PDAYRATE of 6.72 per person-year.

In terms of discharge status, rural districts accounted for the greatest per capita rates of 'discharge with or without approval' having a SEPRATE of .49 and a PDAYRATE of 4.63 per person-year, and of 'transfers to hospitals' with respective rates of .06 and .72 per person-year (see Table 14). Suburban districts demonstrated slightly greater rates of utilization for institutional transfers with a SEPRATE of .04 and a PDAYRATE of .92 per person-year compared to metro and rural district SEPRATES of .03 and .04, and PDAYRATES of .81 and .74, respectively. Metro districts, however, accounted for the greatest PDAYRATE associated with discharges to home care at .29 per person-year, more than twice that of rural and suburban districts which had rates of .13 and .12 per person-year, respectively. As expected, the rate of hospital utilization for deceased discharges was relatively constant across all patient origins indicating little or no difference in the rate of expiry among rural, suburban and metro district patients.

TABLE 14

ELDERLY DISCHARGE STATUS BROKEN DOWN BY PATIENT ORIGIN

			PATIENT ORIGIN							
			RURAL	%	SUBURBAN	%	METRO	%	TOTAL	%
DISCHARGE STATUS	DISCHARGED WITH/WITHOUT APPROVAL	SEPS	28955	39.1	6494	8.8	21750	29.4	57199	77.2
		PDAYS	276042	30.7	68614	7.6	241652	26.9	586308	65.2
		ALOS	9.5		10.6		11.1		10.3	
		SEPRATE	0.49		0.34		0.26		0.35	
		PDAYRATE	4.63		3.60		2.85		3.59	
	TRANSFERRED TO HOSPITAL	SEPS	3477	4.7	352	0.5	848	1.1	4677	6.3
		PDAYS	43250	4.8	5771	0.6	14824	1.6	63845	7.1
		ALOS	12.4		16.4		17.5		13.7	
		SEPRATE	0.06		0.02		0.01			
		PDAYRATE	0.72		0.30		0.17			
	TRANSFERRED TO INSTITUTION	SEPS	2435	3.3	842	1.1	2747	3.7	6024	8.1
		PDAYS	44156	4.9	17532	1.9	68517	7.6	130205	14.5
		ALOS	18.1		20.8		24.9		21.6	
		SEPRATE	0.04		0.04		0.03		0.04	
		PDAYRATE	0.74		0.92		0.81		0.80	
	HOME CARE	SEPS	400	0.5	111	0.1	1046	1.4	1557	2.1
		PDAYS	7569	0.8	2338	0.3	24162	2.7	34069	3.8
		ALOS	18.9		21.1		23.1		21.9	
		SEPRATE	0.01		0.01		0.01		0.01	
		PDAYRATE	0.13		0.12		0.29		0.21	
	DIED	SEPS	1725	2.3	586	0.8	2287	3.1	4598	6.2
		PDAYS	30134	3.3	9819	1.1	45359	5.0	85312	9.5
		ALOS	17.5		16.8		19.8		18.6	
		SEPRATE	0.03		0.03		0.03		0.03	
		PDAYRATE	0.51		0.51		0.54		0.52	
	TOTAL	SEPS	36992	50.0	8385	11.3	28678	38.7	74055	100.0
		PDAYS	401151	44.6	104074	11.6	394514	43.8	899739	100.0
		ALOS	10.8		12.4		13.8		12.1	
		SEPRATE	0.62		0.44		0.34		0.45	
		PDAYRATE	6.72		5.45		4.66		5.50	

In combination, these rates suggest a particular pattern of discharge which is based upon ease of access to the acute care hospital system, and access to alternative services and supports. Specifically, rural district residents would seem to have relatively easy access to the acute care system, and metro residents to alternative services and supports, each of which would conceivably delay the need for institutionalization. Suburban district patients, however, are less likely to have readily available access to either acute care facilities or alternative delivery services and would therefore demonstrate the greatest rate of institutionalization following hospitalization.

In summary, differential patterns of discharge were found among rural, suburban and metro district patients. Metro district elderly demonstrated markedly lower overall rates of hospital utilization but substantially greater discharges to home care services. Suburban district patients demonstrated the highest rate of institutional discharge. At the same time, rural district elderly accounted for the greatest rate of utilization for discharges with or without approval and to other hospitals.

4.3.4 Diagnostic Patterns of Discharge

A general analysis of discharge status relative to patient diagnosis was conducted to identify whether diagnostic-specific patterns of discharge existed. To

facilitate this analysis, only the leading primary diagnoses were employed. The results are presented in Table 15.

As expected, the majority of SEPS and PDAYS across all diagnoses were 'discharged with/without approval'. Yet among three primary diagnoses in particular, a large proportion of SEPS were discharged to one of the remaining discharge categories. For example, of the 16407 primary circulatory SEPS, 26.2 percent (which accounted for 37.2 percent of the respective PDAYS) were discharged with other than the 'with/without approval' status. To a greater extent, 34.0 and 35.1 percent of primary injury or poisoning and neoplastic SEPS, respectively, (which accounted for 35.1 and 48.9 percent of their respective PDAYS), were similarly discharged. As such, it appeared that some diagnoses presented a greater tendency toward alternative discharges.

In fact, specific patterns of discharge status were evident among the previously mentioned diagnoses. Of the primary circulatory SEPS, for example, 10.9 percent were discharged deceased indicating that approximately 1 out of 10 cases died in hospital. Further, although only 7.4 percent of primary circulatory SEPS were transferred to institutional settings, these SEPS accounted for 15.2 percent of all primary circulatory PDAYS. Together, deceased and institutional discharges accounted for 18.3 and 27.2 percent of all primary circulatory SEPS and PDAYS respectively.

TABLE 15

DISCHARGE STATUS BROKEN DOWN BY LEADING PRIMARY DIAGNOSES

PRIMARY DIAGNOSES		DISCHARGE STATUS											
		DISCHARGED WITH/WITHOUT APPROVAL	%	TRANSFERRED TO HOSPITAL	%	TRANSFERRED TO INSTITUTION	%	HOME CARE	%	DIED (NO AUTOPSY)	%	TOTAL	%
Circulatory System	SEPS	12113	73.8	943	5.7	1216	7.4	342	2.1	1793	10.9	16407	100.0
	PDAYS	132030.0	62.8	13384.0	6.4	32012.0	15.2	7479.0	3.6	25305.0	12.0	210210.0	100.0
	ALOS	10.9		14.2		26.3		21.9		14.1		12.8	
Digestive System	SEPS	7637	81.1	628	6.7	686	7.3	140	1.5	320	3.4	9413	100.0
	PDAYS	72042	73.6	6252	6.4	11457	11.7	2866	2.9	5263	5.4	97880	100.0
	ALOS	9.4		10.0		16.7		20.5		16.4		10.4	
Respiratory System	SEPS	6329	78.6	257	3.2	729	9.1	142	1.8	594	7.4	8051	100.0
	PDAYS	62916	68.9	2994	3.3	12623	13.8	2564	2.8	10271	11.2	91368	100.0
	ALOS	9.9		11.6		17.3		18.1		17.3		11.3	
Neoplasms	SEPS	4553	64.9	682	9.7	354	5.0	234	3.3	1196	17.0	7019	100.0
	PDAYS	57911	51.1	11454	10.1	9130	8.1	5796	5.1	29014	25.6	113305	100.0
	ALOS	12.7		16.8		25.8		24.8		24.3		16.1	
Injury and Poisonings	SEPS	3573	66.0	711	13.1	731	13.5	172	3.2	224	4.1	5411	100.0
	PDAYS	42336	53.0	9751	12.2	18085	22.7	4941	6.2	4730	5.9	79843	100.0
	ALOS	11.8		13.7		24.7		28.7		21.1		14.8	
Genitourinary System	SEPS	4597	86.2	296	5.6	312	5.9	37	0.7	89	1.7	5331	100.0
	PDAYS	40166	79.5	2901	5.7	4685	9.3	774	1.5	2009	4.0	50535	100.0
	ALOS	8.7		9.8		15.0		20.9		22.6		9.5	
Nervous & Sense Organs	SEPS	4101	87.5	123	2.6	347	7.4	75	1.6	42	0.9	4688	100.0
	PDAYS	26754	74.9	1972	5.5	5366	15.0	768	2.1	873	2.4	35733	100.0
	ALOS	6.5		16.0		15.5		10.2		20.8		7.6	
Musculoskeletal System	SEPS	3655	82.5	345	7.8	283	6.4	118	2.7	29	0.7	4430	100.0
	PDAYS	42011	73.1	5982	10.4	5998	10.4	2817	4.9	630	1.1	57438	100.0
	ALOS	11.5		17.3		21.2		23.9		21.7		13.0	
Other Primary Diagnoses	SEPS	10641	80.0	692	5.2	1364	10.3	297	2.2	311	2.3	13305	100.0
	PDAYS	110142	67.4	9155	5.6	30849	18.9	6064	3.7	7217	4.4	163427	100.0
	ALOS	10.4		13.2		22.6		20.4		23.2		12.3	
Total	SEPS	57199	77.2	4677	6.3	6024	8.1	1557	2.1	4598	6.2	74055	100.0
	PDAYS	586308	65.2	63845	7.1	130205	14.5	34069	3.8	85312	9.5	899739	100.0
	ALOS	10.3		13.7		21.6		21.9		18.6		12.1	

Predictably, primary neoplastic diagnoses demonstrated the largest proportion of deceased discharges. Patient death was reported in 17.0 percent of all primary neoplastic SEPS, representing the consumption of 25.6 percent of associated PDAYS. Primary neoplastic diagnoses were also associated with a considerable proportion of home care discharges. Specifically, 3.3 percent of primary neoplastic SEPS and 5.1 percent of the associated PDAYS were discharged with home care.

In contrast, primary injury and poisoning SEPS were more often discharged to other hospitals, (13.1 percent), or to institutions (13.5 percent), or with home care (3.2 percent). In combination, these discharge outcomes accounted for 29.8 and 41.0 percent of all injury and poisonings SEPS and PDAYS, respectively. Moreover, primary injury and poisoning diagnoses were associated with the largest proportion of alternative discharges. As such, 34.0 and 47.0 percent of the associated SEPS and PDAYS, respectively, were discharged to other hospitals, to institutions, with home care or deceased.

Although ALOSs varied across diagnoses and discharge statuses, the longest ALOSs were consistently associated with deceased, institutional and home care discharges. While primary genitourinary and nervous sense organ diagnoses demonstrated the longest ALOSs (22.6 and 20.8 days, respectively) for deceased discharges, circulatory and neoplastic diagnoses demonstrated the longest ALOS (26.3 and

25.8 days, respectively) for institutional discharges. Among the remaining leading primary diagnoses, home care discharges demonstrated the greatest ALOS.

In total, diagnostic-specific discharge patterns were evident, especially among primary circulatory, neoplastic and injury or poisoning diagnoses. Proportionately, these diagnoses demonstrated tendencies toward specific discharge outcomes, in particular, deceased, hospital and institutional discharges.

4.3.5 Summary of Findings

In summary, the foregoing analysis of elderly discharge status revealed the following:

1. Discharges other than 'with approval' accounted for 23.3 percent of all elderly SEPS and 35.2 percent of all elderly PDAYS.
2. With the exception of discharges 'with approval,' deceased and institutional discharges combined accounted for the greatest proportion of utilization.
3. Distinct discharge patterns were evident among elderly age groupings with the old-old demonstrating a greater proportion of deceased and institutional discharges.
4. Transfers to nursing homes accounted for 50.1 and 42.6 percent of all SEPS and PDAYS related to institutional placements, respectively. Although patients waiting placement to auxiliary hospitals accounted for only 29.1 percent of the pre-institutional SEPS, they consumed

40.9 percent of the associated PDAYS. As such, discharges to nursing homes accounted for the greater proportion of elderly SEPS and PDAYS, but discharges to auxiliary hospitals accounted for a comparable proportion of PDAYS in acute care hospitals.

5. Accident related SEPS had consistently longer ALOSs across all discharge statuses and a greater proportion of institutional, home care, hospital and deceased discharges.
6. Tertiary type hospitals accounted for the largest proportion of deceased and home care discharges, while primary hospitals discharged a greater proportion of SEPS to hospitals and institutions, thereby demonstrating different levels of service delivery across hospital types.
7. Patterns of discharge status varied greatly among rural, suburban and metro district patients: a) rural patients accounted for the greatest rate of utilization, 'with/without approval' and to other hospitals; b) suburban patients demonstrated the highest rate of institutional discharge; and c) metro patients demonstrated the greatest rate of home care discharge.
8. Diagnostic-specific patterns of discharge suggested that irrespective of the 'with/without approval' status, primary circulatory, neoplastic and injury or poisoning diagnoses demonstrated a substantial proportion of alternative discharges. As such, deceased discharges,

transfers to other hospitals, to institutional settings, and to home care accounted for a considerable proportion of discharges within these primary diagnostic categories.

4.4 Diagnostic Indices

Investigation of the relationship between diagnoses and resource consumption necessitated the development of indices which related diagnoses to hospital resource use. Initial efforts to develop the indices sought to provide a measure of variability for the simultaneous interaction between primary and secondary diagnoses as well as surgical procedures. Consequently, a matrix approach was derived using ALOSs. Due to the limited interaction of secondary diagnoses and primary surgical procedures however, (few cells in the matrix had more than 100 cases), the method was abandoned.

Alternatively, a hierarchical approach was employed in which secondary diagnoses and primary operative procedures were treated independently rather than simultaneously. Specifically, ALOSs were computed for each diagnostic combination of primary and secondary diagnoses or primary diagnoses and surgical procedures for combinations having a minimum of 100 cases. Using the overall elderly ALOS in the denominator, ALOSs for all cases were measured relative to the overall elderly average. Relative average lengths of stay (RALOSs) were, therefore, calculated as follows;

(ALOS x 100) / Overall elderly ALOS = RALOS

for all combinations of primary and secondary diagnoses or primary diagnoses and surgical procedures.

Incorporating the diagnostic standard previously defined in the study, three diagnostic indices were developed. Medical indices reflected primary and secondary diagnostic combinations. As such, the medical index values provided a measure of the impact of specific diagnostic combinations on elderly LOSs, relative to the defined study standard. For example, whereas a primary uncomplicated circulatory diagnoses had an index value of 1.00 (Table C.1), a primary circulatory diagnosis combined with a secondary neoplastic diagnosis had an index value of 1.75 (Table C.1), indicating that the latter diagnostic combination was associated with a 75 percent greater ALOS. Similarly, surgical indices were based on primary diagnostic and surgical procedure combinations and again, provided a relative measure of the impact of particular diagnostic and surgical procedure combinations on LOSs. As an example, whereas an uncomplicated primary circulatory diagnosis had an index value of 1.00, a primary circulatory diagnosis combined with a cardiovascular operative procedure generated an index value of 1.53 (Table D.1), indicating a 53 percent increase in the LOS associated with the latter diagnostic and operative combination. Lastly, medical-surgical indices reflected the interaction of diagnoses and surgical procedures combined. As such, the impact of diagnostic

multiplicity on LOS was delineated. To illustrate, the following example is provided. A patient having a primary circulatory diagnosis in combination with a secondary musculoskeletal diagnoses and a musculoskeletal operative procedure would rate an index value of 4.47 (1.41 x 3.17 from Tables C.1 and D.1 respectively). Accordingly, this diagnostic and surgical combination would result in a LOS 4.47 times as great as the study standard of 7.56 days.

In this way, the diagnostic indices delineated the impact of specific diagnostic combinations on LOS, relative to a defined study standard. As an indirect measure of resource consumption, LOSs provided an indication of the influence of diagnoses and procedures on elderly utilization of hospital resources.

4.5 Multiple Regression Analyses

Assessment of the predictive value of the diagnostic indices developed in this research, in conjunction with an estimation of the effects of other non-diagnostic variables, required that multiple regression analyses be undertaken. Employing a forced entry regression analyses, three specifications were formulated using three sets of independent variables. These specifications consisted of:

1. 'A': a diagnostic specification which was used to assess the value of the diagnostic indices;
2. 'B': a non-diagnostic specification which was employed to assess the effects of the non-diagnostic variables;

and

3. 'C': a diagnostic and non-diagnostic specification which provided a simultaneous assessment of both variable sets.

The relative explanatory power of the independent variable set under each specification is reflected in the R-square values given in Table 16. These values reflect the proportion of variation in elderly LOS (dependent variable) explained by various factors such as diagnoses, age, sex and so on (independent variables). The unstandardized regression coefficients depicted in Table 16 represent the expected difference in LOS due to particular independent variables.

In recognition of the skewed exponential distribution of hospital LOSs, non-linear transformations of the dependent variable (LOS) were used to reduce the effects of extreme values of LOS. Although these transformations resulted in a slightly improved R-square value of .179, the interpretation of the analyses utilizing such data was greatly limited. As a result, the linear equation was employed because it facilitated interpretation of the regression analyses.

The following discussion, therefore, focuses on the linear equation results of the regression analyses. Further, in keeping with the purpose of the current research, interpretation of the analyses centered on specification 'C', the combined diagnostic and non-diagnostic specification. As such, the pertinent findings are

TABLE 16

SUMMARY OF REGRESSION ANALYSES

	INDEPENDENT VARIABLES	R-SQUARE	UNSTANDARIZED REGRESSION COEFFICIENTS
A	Diagnostic Variables:	0.107	
	Primary & Secondary Diagnoses		0.698
	Primary Diagnosis & Surgery		2.048
	Multiple Diagnoses		3.443
B	Non-Diagnostic Variables:	0.090	
	Male		-0.374
	Ages 75 to 84		1.131
	Ages 85+		1.352
	Rural Patient Origin		-0.270
	Suburban Patient Origin		-0.545
	Primary Hospital Type		-2.635
	Secondary Hospital Type		-0.794
	Accident Related Diagnoses		5.869
	Patient Death		6.781
	Institutionalization		9.979
C	Diagnostic & Non-Diagnostic Variables:	0.162	
	Primary & Secondary Diagnoses		-0.131
	Primary Diagnosis & Surgery		2.109
	Multiple Diagnoses		3.031
	Male		-0.404
	Ages 75 to 84		1.313
	Ages 85+		1.824
	Rural Patient Origin		-0.866
	Suburban Patient Origin		-1.311
	Primary Hospital Type		-1.694
	Secondary Hospital Type		-0.301
	Accident Related Diagnoses		3.256
	Patient Death		4.534
	Institutionalization		8.886

presented.

4.5.1 Specification A: Diagnostic Variables

Regression of the dependent variable (LOS) on the diagnostic independent variables resulted in an R-square value of .107, indicating that only 10.7 percent of the variation in LOS was explained by the diagnostic variables (Table 16). As such, the diagnostic variables appeared to account for an unsubstantial proportion of the variation in LOS. This representation of a weak relationship between diagnoses and LOS, however, may have been a result of the study design rather than a true reflection of the relationship.

Specifically, as a consequence of the broad diagnostic categories used, much within group variation existed. The effects of collapsing diagnoses into these broad categories thus diluted the explanatory power of the diagnoses in relation to LOS. Further, as a proxy for resource consumption, LOS did not provide a sensitive measure of resource use, and did not reflect severity of illness. Finally, the low R-square value may partially reflect non-medical stays (administratively necessary days), which are frequently observed in elderly cases and are virtually unrelated to medical or diagnostic need. In combination with the non-additive nature of LOS, these factors appeared to account for the low R-square value of specification 'A'. It was clear, therefore, that variation in elderly hospital

stays could not be sufficiently explained in terms of the diagnostic variables defined in this research.

4.5.2 Specification B: Non-Diagnostic Variables

The amount of variation in the dependent variable accounted for by the non-diagnostic predictor variables proved negligible. In combination, regression of the dependent variable on the ten non-diagnostic variables resulted in a R-square value of .090. The non-diagnostic independent variables, therefore, explained only 9 percent of the variation in elderly LOS, even less than did the diagnostic variables previously discussed.

Examination of the associated beta weights indicated that of all the non-diagnostic variables analyzed post acute care institutionalization, accident codes, and patient death were the best predictors of elderly LOS. Overall, however, only a minor amount of variation in elderly LOS was accounted for by the non-diagnostic variables. Collectively, the explanatory value of the non-diagnostic variables was inappreciable.

4.5.3 Specification C: Diagnostic and Non-Diagnostic Variables

While the foregoing regression analyses resulted in relatively small R-square values, the combination of diagnostic and non-diagnostic independent variables in specification 'C' led to an improved R-square value of .162

(Table 16). Accordingly, 16 percent of the variation in elderly LOS was explained by the diagnostic and non-diagnostic variables combined.

Examination of the unstandardized regression coefficients ascertained that the magnitude of effect on LOS changed considerably from the previous analyses across most independent variables. In totality, several observations were made. After statistical adjustment for all other independent variables concerned: the old and old-old demonstrated LOSs which were 1.3 and 1.8 days longer, respectively, than the young-old; and elderly males had LOSs which were 0.4 days shorter than elderly females. Hospital stays in primary hospitals were 1.7 days shorter than in tertiary hospitals and similarly, rural and suburban district patients had LOSs that were 0.9 and 1.3 days shorter, respectively, than metro district patients. Furthermore, elderly patients who were discharged to an institution or expired in hospital experienced hospital stays which were 8.9 and 4.5 days greater than patients who were not institutionalized or survived hospitalization, respectively. And finally, patients with accident diagnoses had LOSs that were 3.3 days longer than those who had not accident-related diagnoses.

With regard to the diagnostic variables, it was found that after statistical adjustment for all other independent variables, multiple diagnoses, operative procedures and secondary diagnoses contributed, in that order, to a change

in LOS. Incorporation of the diagnostic complexity measures (DCMs) into the regression analyses thus permitted the definition of a one unit change in the DCM for each of the diagnostic variables. Tables C.1 to C.8 and D.1 to D.8 in Appendices C and D depict the respective DCM values for specific diagnostic and surgical combinations. Utilizing these values in conjunction with the regression coefficients, it was possible to predict the change in LOSs for particular diagnostic combinations when all other factors such as patient age, sex, district and so on were considered equal.

Examination of the unstandardized regression coefficients in Table 16 indicated that a one unit change in the DCM was associated with a change in LOS of -0.13, 2.11 and 3.03 days for secondary diagnoses, primary operative procedures and a diagnostic combination thereof, respectively. Interpretation of the negative value observed for secondary diagnoses implies that after statistical adjustment for all other variables, and relative to the study standard, secondary diagnoses alone were associated with slightly shorter ALOSs. In order to exemplify the application of the DCMs the following example is provided.

As illustrated in Table C.1, a patient having a primary circulatory diagnosis in combination with a secondary mental disorder rated a DCM of 1.60. Since the regression coefficient indicated that a one unit change in the DCM was associated with a change in LOS of -0.13 days, this means

that all other factors being equal, this patient would stay .08 days less than the defined study standard, or 7.48 days. The calculation was as follows:

Regression Coefficient x (DCM - Standard DCM)

= Change in LOS

The change in LOS was then added to the LOS of the defined standard (uncomplicated primary circulatory diagnoses), of 7.56 days to give the predicted diagnostic-specific LOS.

Similarly, if a patient with a primary circulatory diagnosis had a cardiovascular procedure, the DCM for that combination would be 1.53 (Table D.1). Since the regression coefficient indicated that a one unit change in the DCM was associated with a change in LOS of 2.11 days, all other factors being equal, this patient would stay 1.12 days longer than the standard or 8.68 days. If, however, a patient had multiple diagnoses such as a primary circulatory diagnosis, a secondary mental disorder and a cardiovascular operative procedure, a one unit change in the DCM was associated with a change in LOS of 3.03 days. In this case, the product of the DCMs of both diagnostic combinations was used to determine the change in LOS. It was found that such a patient would stay 4.39 days longer than the standard or 11.95 days. Accordingly, the LOS of any diagnostic combination can be computed using the DCMs as discussed. With the defined diagnostic standard having an index value of 1.00, all other index values (or DCMs) were computed in relation to the standard. As such, utilization of the DCMs

enables diagnostic-specific predictions of geriatric LOSs.

Interestingly, excluding cases with a LOS less than the standard of 7.56 days, and thus a DCM less than 1.00, secondary diagnoses actually reduced LOS. It appeared that after statistical adjustment for all other diagnostic and non-diagnostic independent variables, secondary diagnoses had only a minimal effect on geriatric LOSs. Indeed, examination of the beta weights indicated that secondary diagnoses were the weakest predictors of elderly hospital stays.

In aggregate, a patient profile was suggested within the confines of the explanatory value of this analysis. As such, longer lengths of stay in hospital were most highly associated with elderly females 85 years and older having multiple diagnoses who were discharged to an institutional setting. Moreover, tertiary hospitals and metro origin patients were associated with longer hospital stays. In fact, examination of the respective beta weights indicates that relative to the independent variables studied, multiple diagnoses, institutionalization, accident related diagnoses and patient death were the best predictors of elderly LOS. In recollection of the conceptual framework employed in this study, it was clear that individual, societal and health system determinants influenced the utilization of hospital services by the elderly.

A further note is warranted with respect to the change in R-square when all independent variables were entered into

the regression analysis. Separately, the diagnostic and non-diagnostic variables resulted in R-square values of 0.11 and 0.90 respectively, while in combination the R-square rose to 0.16. The addition of the non-diagnostic set of variables to the regression equation resulted in an increased R-square value of approximately 5 percent, thus indicating that 5 percent more variation in the dependent variable was explained with the addition of the non-diagnostic variable set.

In conclusion, the amount of variation in elderly LOS accounted for by the variables representing both diagnostic and non-diagnostic factors was very small. Although this composite analysis of independent variables provided an improved R-square value in comparison with either diagnostic or non-diagnostic variables separately, it appears that elderly LOSs cannot be satisfactorily explained in terms of the variables so defined in this study.

4.5.4 Summary of Findings

Although the selection of independent variables used to predict elderly LOS was deliberate, it was evident that not all relevant variables were identified and measured. The amount of variation in the dependent variable accounted for by the independent variables used in the regression analyses (R-square) did not exceed 16 percent. This indicated that the explanatory value of the diagnostic and non-diagnostic variables combined was very limited.

Accordingly, cautious interpretation of these results is necessary since the overall explanatory power of the variables employed was relatively poor. The low R-square values likely reflect the fact that the diagnostic categories used were very broad and in utilizing the RALOS, a mid-point having large S.D.s, was analyzed. As a result, within group variation existed and hence a small R-square was produced. It is clear, therefore, that variation in elderly ALOS cannot be adequately explained in terms of the diagnostic and non-diagnostic variables defined in this study. Despite the poor explanatory power of the variables employed, however, the development of a diagnostic multiplicity index is significant because an overall association between diagnoses and LOS was demonstrated. At an exploratory level, it has been shown that case specific diagnostic combinations can be used to predict elderly LOSs in hospital. As such, case-mix classifications are made possible.

Chapter 5

SUMMARY AND RECOMMENDATIONS

A conspectus of the study is presented in this final chapter which incorporates major study findings and subsequent conclusions. In addition, recommendations for further research are proposed.

5.1 Summary of the Study

Concern regarding the elderly's disproportionate use of acute care hospitals stems from the emanating reality of the changing age structure and current fiscal restraint. As such, the provision of health care services to the elderly has emerged as a major challenge to health service planning and policy development endeavors. Within the acute care hospital sector, in particular, issues related to misutilization, long-stay patients, and the generally chronic rather than acute care needs of the elderly have arisen, compelling a perspicacious and critical examination of the delivery of acute care services to the elderly. Aiming to address these salient issues, this study was undertaken to assess diagnostic-specific aspects of acute care hospital utilization by the elderly.

A selective review of the literature supplied the foundation for a conceptual framework for the study and further, provided the basis for the research design and methodology. In brief, the review of utilization models and theoretical concepts suggested that a variety of individual,

societal and health system determinants interact with need, demand, and supply factors and result in health service utilization. While many factors which affect utilization are not unique to the elderly population, the implication in the literature was that certain aspects of the aging process and the health care system constitute unique health care needs and demands among the elderly. A review of classification systems demonstrated the utility of diagnostic analysis and case-mix measurement in assessing resource consumption. In addition, literature pertaining to the discharge status of elderly patients was reviewed. It suggested that enhanced knowledge of the determinants of elderly discharge status can improve health resource use by delineating the interreliance of all components of the health system.

The applied research strategy was of an exploratory and descriptive nature utilizing retrospective data in a cross-sectional design. Employing a diagnostic emphasis, four data analysis strategies were discussed. Firstly, an assessment of overall provincial utilization patterns and rates was conducted. Secondly, examination of elderly discharge status patterns was undertaken. Thirdly, diagnostic indices were developed. And finally, diagnostic multiplicity was investigated relative to elderly resource consumption using multiple regression analyses.

5.2 Major Findings

The major findings of this study included:

1. The overall provincial analysis indicated that:
   a. Greater utilization of hospital services was associated with advancing age. Across all age groupings, elderly males demonstrated the highest per capita rates of utilization, with the old-old having the highest rate.
   b. While tertiary hospitals accounted for the greatest proportion of elderly patient-days (38.9 percent), primary hospitals accounted for the greatest proportion of elderly separations (42.3 percent).
   c. Rural elderly demonstrated substantially greater per capita rates of utilization in comparison with elderly from other districts. On average, rural, suburban and metro elderly spent 6.7, 5.4 and 4.7 days per year, respectively, in acute care hospitals.
2. Diagnostic-specific analysis revealed that eight leading primary diagnoses accounted for over 80 percent of all elderly separations and patient-days. Circulatory, digestive, respiratory and neoplastic diagnoses together accounted for more than 55 percent of all elderly separations and patient-days. Moreover, diagnoses of the circulatory and musculoskeletal system, neoplasms and injury or poisonings demonstrated above average and highly variable lengths of stay.

3. Diagnostic-specific patterns of utilization indicated that elderly utilization tended to centre on one body system. Further, while secondary diagnoses were associated with substantially increased lengths of stay, particularly in specific combinations, surgical procedures were associated with reduced elderly hospital stays (except among primary circulatory and respiratory diagnoses). Just as primary nervous and sense organ, neoplastic and genitourinary diagnoses demonstrated particularly large proportions of operative intervention (even excluding the miscellaneous category), specific primary diagnoses were associated with diagnostic multiplicity. Overall, primary diagnoses having large proportions of surgical intervention tended to be less associated with secondary diagnoses. Secondary circulatory diagnoses accounted for a substantial proportion of all separations and patient-days among primary diagnoses. Surgical procedures associated with primary circulatory diagnoses demonstrated exceedingly high relative average lengths of stay.
4. Analysis of elderly discharge status from acute care hospitals revealed that discharges other than 'with approval' accounted for 23.3 percent of all elderly SEPS and 35.2 percent of all PDAYS. Of these alternative discharges, deceased and institutional discharges combined accounted for the greatest proportion of utilization. Further, age-specific discharge patterns

were evident, with the old-old demonstrating the greatest proportion of deceased and institutional discharges.

5. Examination of acute care hospital utilization preceeding institutionalization revealed that transfers to nursing homes accounted for the greatest percentage of elderly SEPS (50.1 percent), and PDAYS (42.6 percent). Although transfers to auxiliary hospitals accounted for only 29.1 percent of elderly discharges to institutions, these auxiliary placements accounted for 40.9 percent of the associated PDAYS.
6. Accident related SEPS demonstrated consistently longer ALOSs across all discharge statuses and a greater proportion of institutional, home care, hospital and deceased discharges.
7. Differing levels of service delivery were exhibited across hospital types with tertiary hospitals accounting for the largest proportion of deceased and home care discharges, while primary hospitals separated a greater proportion of elderly patients to other hospitals and institutions.
8. Patterns of discharge status varied with patient origins. As such, the findings indicated that:
   a. rural patients accounted for the greatest rate of utilization, 'with or without approval' and to other hospitals;
   b. suburban patients demonstrated the highest rate of

institutional discharges; and

c. metro patients demonstrated the greatest rate of home care discharges.

9. Diagnostic-specific patterns of discharge status revealed that, irrespective of the 'with or without approval' status, primary circulatory, neoplastic, and injury or poisonings diagnoses exhibited certain patterns of discharge. Specifically:

   a. More than one in ten primary circulatory cases were discharged deceased. Further, though only 7.4 percent of primary circulatory SEPS were transferred to institutions, these cases consumed 15.2 percent of associated PDAYS. In combination, deceased and institutional discharges accounted for a substantial proportion of all primary circulatory SEPS and PDAYS.

   b. Primary neoplastic discharges also demonstrated a large proportion of deceased discharges which accounted for one quarter of all primary neoplastic PDAYS. In addition, primary neoplastic diagnoses were associated with a considerable proportion of home care discharges.

   c. Among cases having primary injury and poisonings diagnoses, almost one third were discharged to another hospital, to an institution or with home care. Furthermore, among all of the leading primary diagnoses, primary injury and poisoning diagnoses

accounted for the greatest proportion of home care discharges.

10. In an attempt to explain variation in elderly LOS, it was found that whereas the diagnostic set of variables resulted in a R-square of .107, the addition of the non-diagnostic set of variables to the regression equation resulted in an increased R-square value of approximately 5 percent. As such, 5 percent more of the variation in LOS was explained with the addition of the non-diagnostic variable set. In total, the diagnostic and non-diagnostic variables under study resulted in a R-square of .162, thus explaining 16.2 percent of the variation in elderly LOS. As such, the explanatory power of the regression equation was relatively weak. At an exploratory level, however, it was found that case-specific diagnostic combinations could be used to predict elderly LOSs in hospital.
11. Employing hospital LOS as a proxy for resource use, the regression analyses indicated that:
    a. hospital LOSs increased with advancing age,
    b. elderly males had shorter hospital stays than elderly females,
    c. hospital stays differed across hospital types with tertiary hospital stays demonstrating the longest stays,
    d. patient origin was related to LOSs, such that metro district patients had the longest stays,

e. discharges to institutions resulted in substantially increased hospital stays while deceased discharges were associated with moderately increased hospital stays,

f. accident related diagnoses were associated with longer hospital stays, and

g. multiple diagnoses, operative procedures and secondary diagnoses contributed, in that order, to a change in LOS. Further, after statistical adjustment for all other variables, secondary diagnoses were found to have only a minimal effect on LOS.

5.3 Conclusions

Subsequent to the preceeding data analyses, the following conclusions were evident:

1. Hospital-specific patterns of utilization indicated that while tertiary type hospitals were associated with increased LOSs and the largest proportion of PDAYS across all hospital types, primary hospitals demonstrated the greatest proportion of SEPS. In this way, differing levels of service delivery, in which tertiary hospitals fulfilled a referral role and primary hospitals demonstrated a greater throughput, were made evident.
2. The highest rates of hospital utilization were associated with the rural elderly while the lowest rates were associated with the metro or urban elderly. These

rates appear to coincide with the greater availability and accessibility of alternative services such as home care, and other institutional programs and services in metro areas than in rural areas.

3. Over 80 percent of all elderly SEPS and PDAYS were associated with eight leading primary diagnoses. Although some of these diagnoses were more associated with secondary diagnoses as opposed to operative procedures, and vice versa, in general, elderly utilization tended to centre on one body system such that additional diagnoses and operative procedures most often involved the body system of the prime diagnosis.
4. Given that 23.3 percent of all elderly SEPS, which represent 35.2 percent of all elderly PDAYS, are discharges other than 'with approval', patterns of elderly discharge status warrant consideration. From a systems perspective, in particular, such patterns offer insight into individual, societal and health system factors which are reflected in discharge patterns. For example, health system factors such as placement delays, which result in the back-up of geriatric patients in acute care hospitals, are reflected in hospital discharge patterns. Further, diagnostic-specific differences in discharge status have implications for post-acute care service requirements.
5. The negligible extent to which the diagnostic and non-diagnostic variables used in this study explained

elderly LOS in acute care hospitals led to three conclusions. First, it is necessary to examine other factors such as physician practices, and the functional status of patients, which may influence LOS. Second, the study design incorporated broad diagnostic categories, and as such, may have allowed too much within group variation. Third, the use of LOS as a proxy for resource need required that the inefficiencies of that measure be tolerated.

6. Overall, however, within the confines of the present study, diagnostic multiplicity was found to positively influence elderly LOS. In combination with non-diagnostic variables, the diagnostic multiplicity index developed in this research facilitated the prediction of resource consumption, as measured by LOS, and as such identified the utility of such an approach.

5.4 Recommendations

In view of the foregoing findings and conclusions, the following recommendations are submitted:

1. Further refinement and extension of this study should encompass:
   a. a modified diagnostic categorization which would reduce within group variation, and perhaps incorporate DRGs, and
   b. a longtitudinal study of the relationship between elderly LOS and diagnostic multiplicity.

2. The impact of dying patients in relation to acute care hospital resource consumption has been over-rated in the literature as the hospitalization experience of elderly decedents in Alberta differed substantially from that reported. Accordingly, a comprehensive analysis of acute care hospital utilization by elderly decedents, which recognizes the use of alternative services, is required.
3. Attempts to vertically integrate the health care system in Alberta require indepth analysis of elderly discharge status. As acute care hospitals serve a major role in referrals to long-term care and home care, knowledge of the diagnostic differences and case-mix of such referrals should assist in the program planning of these and alternative services.
4. Further research may be conducted to assess:
   a. the impact of other determinants of utilization, such as physician practice patterns and the patient's functional status, on elderly LOS;
   b. elderly utilization of alternative (non-acute) services in urban versus rural areas; and
   c. the reasons for and the care requirements of long-stay elderly patients.

SELECTED REFERENCES

Aday, L.A., & Andersen, R. (1974). A framework for the study of access to medical care. Health Services Research, 9, 208-220.

Alberta Hospitals and Medical Care. Annual Report. Edmonton: Alberta Hospitals and Medical Care, 1981-1982.

Alexander, J.A., Evashwick, C.J., & Rundall, T. (1984). Hospitals and the provision of care to the aged: A cluster analysis. Inquiry, 21, 303-314.

Andersen, R., & Anderson, O. (1979). Trends in the use of health services. In H.E. Freeman, S. Levine & L.G. Reeder (Eds.), Handbook of Medical Sociology, 3rd Edition (pp. 371-391). New Jersey: Prentice Hall Inc.

Anderson, J.G. (1973). Health services utilization: Framework and review. Health Services Research, 8, 184-199.

Anderson, O.W. (1979). The utilization of health services. In H.E. Freeman, S. Levine & L.G. Reeder (Eds.), Handbook of Medical Sociology, 3rd Edition, (pp. 349-367). New Jersey: Prentice-Hall Inc.

Andrews, K. (1986). Relevance of readmission of elderly patients discharged form a geriatric unit. Journal of the American Geriatrics Society, 34, 5-11.

Andrews, K. (1985). Demographic changes and resources for the elderly. British Medical Journal, 290, 1023-1024.

Andrews, K., & Brocklehurst, J.C. (1985). The implications of demographic changes on resourse allocation. Journal of the Royal College of Physicians of London, 19, 109-111.

Attinger, E.O. (1984). Impacts of the technological revolution on health care. IEEE Transactions on Biomedical Engineering, BM3-31, 736-743.

Bacon, W.E., Wotjyniak, B., & Krzyzanowski, M. (1984). Hospital Use by the elderly in Poland and the United States. American Journal of Public Health, 74, 1220-1225.

Bashshur, R.L., Shannon, G.W., & Metzner, C.A. (1971). Some ecological differentials in the use of medical services. Health Services Research, 6, 61-75.

Bay, K.S., Leatt, P., & Stinson S.M. (1982). A patient-classification system for long-term care. Medical Care, 20, 468-488.

Bay, K.S., & Nestman, L.J. (1984). The use of bed distribution and service population indexes for hospital bed allocation. Health Services Research, 19, 141-160.

Bay, K., Nestman, L., & Leatt, P. (1981). An application of cluster analysis for grouping Alberta acute care hospitals based on case mix profiles. In C. Tilquin (Ed.), Systems Science in Health Care Vol.2 (pp. 1335-1344). Willowdale, Ontario: Pergamon.

Bayne, J.R.D., & Caygill, J. (1977). Identifying needs and services for the aged. Journal of the American Geriatrics Society, 25, 264-68.

Becker, M.H. (1974). The health belief model and sick role behavior. Health Education Monographs, 2(4), 409-19.

Berenson, R.A., & Pawlson, L.G. (1984). The Medicare prospective payment system and the care of the frail elderly. Journal of the American Geriatrics Society, 32(11), 843-848.

Berg, R.L., Browning, F.E., Hill, J. G., & Wenkert, W. (1970). Assessing the health care needs of the aged. Health Services Research, 5, 36-59.

Berry, R. (1970). Product heterogeneity and hospital cost analysis. Inquiry, 7, 67.

Bognanni, S., & Phillips, K. (1982). Reducing hospital use in Iowa: A conceptual model. Inquiry, 9, 336-345.

Boulding, K.E. (1966). The concept of need for health services. Milbank Memorial Fund Quarterly, 44(Supp.), 202-224.

Branch, L., Jette, A., Evashwick, C., Polansky, M., Rowe, G., & Diehr, P. (1981). Toward understanding elder's health service utilization. Journal of Community Health, 7(2), 80-91.

Brewster, A.C., Karlin, B.C., Hyde, L.A., Jacobs, C.M., Bradbury, R.C., & Chae, Y.M. (1985). MEDISGRPS*: A clinically based approach to classifying hospital patients at admission. Inquiry, 22, 377-387.

Brocklehurst, J., & Shergold, M. (1968). What happens when geriatric patients leave hospital. Lancet, 2, 1133-1135.

Brody, J.A. (1984). Facts, projections, and gaps concerning data on aging. Public Health Reports, 99, 468-475.

Butler, N.G. (1984). Optimal long-term health care for the elderly: An acute care hospital's perspective. Topics in Health Care Financing, 10(3), 57-65.

Canadian Medical Association. (1984). Health a need for redirection. A Task Force on the Allocation of Health Care Resources. Ottawa: Print Action Limited.

Canadian Hospital Association. (1984). Exploring the future of hospitals in Canada: A definition study. National Research Council Canada.

Carr, W.J., & Feldstein, P.J. (1967). The relationship of cost to hospital size. Inquiry, 6(2), 45-65.

Churchman, C.W. (1968). The Systems Approach. New York: Dell Publishing Company.

Commission on Professional and Hospital Activities. (1973). Hospital Adaptation of ICDA, 2nd Edition. Ann Arbor, Michigan.

Cornoni-Huntley, J.C., Foley, D.J., White, L.R., Suzman, R., Berkman, L.F., Evans, D.A., & Wallace, R.B. (1985). Epidemiology of disability in the oldest old: Methodologic issues and preliminary findings. Milbank Memorial Fund Quarterly, 63, 350-376.

Currie, C.T., Smith, R.G., & Williamson, J. (1979). Medical and nursing needs of elderly patients admitted to acute medical beds. Age Ageing, 8, 149-151.

Davies, A.M. (1985). The graying of Israel - implications for health and the need for services. Israel Journal of Medical Sciences, 21, 197-201.

Davis, J.W., Shapiro, M.F., & Kane, R.L. (1984). Level of care and complications among geriatric patients discharged form the medical service of a teaching hospital. Journal of the American Geriatrics Society, 32, 427-430.

Doremus, H.D., & Michenzi, E.M. (1983). Data quality. Medical Care, 21, 1001-1011.

Durbin, R.L., & Antelman, G. (1964). A study of the effects of selected variables on hospital utilization. Hospital Management, 98(August), 57-60.

Evans, R.G. (1984). Strained Mercy: The Economics of Canadian Health Care. Toronto: Butterworths.

Evashwick, C. (1982). Long-term care. Hospitals, 56(13), 50-55.

Farrow, S.C., Rablen, M.R., & Silver, C.P. (1976). Geriatric admissions in East London, 1962-1972. Age Ageing, 5(1), 49-55.

Feldstein, P.J. (1966). Research on the demand for health services. Milbank Memorial Fund Quarterly, 44(Supp.), 128-165.

Fetter, R.B., Shin, Y., Freeman, J.L., Averill, R.F., & Thompson, J.D. (1980). Case-mix definition by diagnosis-related groups. Medical Care, 18, 1-53.

Fiedler, J.L. (1981). A review of the literature on access and utilization of medical care with special emphasis on rural primary care. Social Science & Medicine, 15C, 129-141.

Field, M.B. (1973). The concept of the "health system" at the macro sociological level. Social Science & Medicine, 7, 763-785.

Foreman, M.D. (1986). Acute confusional states in hospitalized elderly: A research dilemma. Nursing Research, 35(1), 34-37.

Frank, R.G., & Lave, J.R. (1985). The impact of Medicaid benefit design on length of hospital stay and patient transfers. Hospital and Community Psychiatry, 36, 749-753.

Fries, J.F. (1980). Aging, natural death and the compression of morbidity. New England Journal of Medicine, 303(3), 130-135.

Fries, J.F. (1983). The compression of morbidity. Milbank Memorial Fund Quarterly, 61, 397-419.

Fries, B.E. & Cooney, L.M. (1985). Validation and use of resource utilization groups as a case-mix measure for long-term care. Medical Care, 23, 123-132.

Gibson, D.M., & Rowland, D.T. (1984). Community vs institutional care: The case of the Australian aged. Social Science & Medicine, 18, 997-1004.

Gillick, M.R., Serrell, N.A., & Gillick, L.S. (1982). Adverse consequences of hospitalization in the elderly. Social Science & Medicine, 16, 1033-1037.

Gingras, G., & Sherman, E.D. (1984). Care of the

elderly-Assessing future needs. Dimensions in Health Services, 61(2), 22-24.

Giovannetti, P. (1979). Understanding patient classification systems. Journal of Nursing Administration, 9(2), 4-9.

Golightly, C.K., Bossenmaier, M.M., McChesney, J.A. Williams, B.S., & Wyble, J.J. (1984). Planning to meet the needs of the hospitalized elderly. The Journal of Nursing Administration, 14(5), 29-38.

Gordon, M., & Vadas, P. (1984). Benefits of access to on-site acute and critical care for the residential section of a multi-level geriatric centre. Journal of the American Geriatrics Society, 32, 453-456.

Greene, V.L. (1984). Premature institutionalization among the rural elderly in Arizona. Public Health Reports, 99, 58-63.

Griffith, J.R., Wilson, P.A., Wolfe, R.A., & Bischak, D.P. (1985). Clinical profiles of hospital discharge rates in local communities. Health Services Research, 20, 131-151.

Grundy, E., & Arie, T. (1984). Institutionalization and the elderly: International comparisons. Age Ageing, 13, 129-137.

Halevi, H.S. (1985). Aged Jewish patients in general hospitals in Israel - past, present and a look into the future. Israel Journal of Medical Sciences, 21, 219-229.

Halevi, H.S., & Benbassat, J. (1982). Trends in hospitalization rates of the elderly for acute and chronic diseases, Israel, 1954-72. Israel Journal of Medical Sciences, 18, 567-573.

Hall, D., & Bytheway, B. (1982). The blocked bed: Definition of a problem. Social Science & Medicine, 16, 1985-1991.

Harel, Z., Noelker, L., & Blake, B.F. (1985). Comprehensive services for the aged: Theoretical and empirical perspectives. The Gerontologist, 25, 644-649

Haug, M.R. (1981). Age and medical care utilization patterns. Journal of Gerontology, 36, 103-111.

Herman, J.M., Culpepper, L., & Franks, P. (1984). Patterns of utilization, disposition, and length of stay among stroke patients in a community hospital setting. Journal of the American Geriatrics Society.

Hochstein, A. (1985). Treating long-stay patients in acute

hospital beds: An economic diagnosis. The Gerontologist, 25, 161-165.

Hodkinson, I., & Hodkinson, H.M. (1981). The long-stay patient. Gerontology, 17, 167-172.

Horn, S.D., & Horn, R.A. (1986). Reliability and validity of the severity of illness index. Medical Care, 24, 159-178.

Horn, S.D., & Schumacher, D.N. (1982). Comparing classification methods: Measurement of variations in charges, length of stay, and mortality. Medical Care, 20, 489-500.

Hornbrook, M.C. (1982). Hospital case mix: Its definitions, measurements & use, Part 2: Review of alternative measures. Medical Care Review, 39, 73-123.

Hulka, B.S., & Wheat, J.R. (1985). Patterns of utilization: The patient perspective. Medical Care, 23, 438-460.

Hurtado, A.V., & Greenlick, M.R. (1971). A disease classification system for analysis of medical care utilization, with a note on symptom classification. Health Services Research, 6, 235-250.

Jeffers, J.R., Bognanno, M.F., & Bartlett, J.C. (1971). On the demand versus need for medical services and the concept of "shortage". American Journal of Public Health, 61, 46-63.

Kalimo, E. (1979a). Health service needs. In W. Holland, J. Ipsen, & J. Kostrzewski (Eds.), Measurement of Levels of Health, (pp. 64-72). Copenhagen: WHO Regional Publications.

Kalimo, E. (1979b). A method for estimating the need for medical care. In W. Holland, J. Ipsen, & J. Kostrzewski (Eds.), Measurement of Levels of Health (pp. 313-319). Copenhagen: WHO Regional Publications.

Kane, R.L., & Mathias, R. (1984). From hospital to nursing home: The long-term care connection. The Gerontologist, 24, 604-609.

Kane, R.L., Matthias, R., & Sampson, S. (1983). The risk of placement in a nursing home after acute hospitalization. Medical Care, 21, 1055-1061.

Kelly, C.H. (1985). Another certain unalienable right. Geriatric Nursing, 6(1), 11.

Klastorin, T.D., & Watts, C.A. (1980). On the measurement of

hospital case mix. Medical Care, 18, 675-685.

Knickman, J.R., & Foltz, A.M. (1985). A statistical analysis of reasons for east-west differences in hospital use. Inquiry, 22(1), 45-58.

Korcok, M. (1981). Exploring health care alternatives for the elderly. Canadian Medical Association Journal, 124, 1524-25.

Kovar, M.G. (1977). Health of the elderly and use of health services. Public Health Reports, 92, 9-19.

Krischer, J.P. (1976). Indexes of severity: Underlying concepts. Health Services Research, 11(Summer), 143-157.

Lamont, C.T., Sampson, S., Matthias, R.E., & Kane, R.L. (1983). The outcome of hospitalization for acute illness in the elderly. Journal of the American Geriatrics Society, 31, 282-288.

Lave, J.R., & Leinhardt, S. (1976). The cost and length of a hospital stay. Inquiry, 13, 327-343.

Lawrence, T.L. (1985). Health care facilities for the elderly in Japan. International Journal of Health Services, 15, 677-697.

Lewis, M.A., Cretin, S., & Kane, R.L. (1985). The natural history of nursing home patients. The Gerontologist, 25, 382-388.

Luke, R.D. (1979). Dimensions in hospital case mix measurement. Inquiry, 16, 38-49.

Marchette, L., & Holloman, F. (1986). Length of stay -- Significant variables. The Journal of Nursing Administration, 16(3), 12-19.

Markson, E.W., Steel, K., & Kane, K. (1983). Administratively necessary days: More than an administrative problem. The Gerontologist, 23, 486-492.

Mausner, J.S., & Bahn, A.K. (1974). Epidemiology An introductory text. Toronto: W.B. Saunders Company.

May, L.A. (1984). The physiologic and psychologic bases of health, disease, and care seeking. In S.J. Williams, & P.R. Torrens (Eds.), Introduction to health services (pp. 35-48). New York: John Wiley & Sons.

McArdle, C., & Wylie, J.C., & Alexander, W.D. (1975). Geriatric patients in an acute medical ward. British Medical Journal, 4, 568-69.

Meiners, M.R., & Coffey, R.M. (1985). Hospital DRGs and the need for long-term care services: An empirical analysis. Health Services Research, 20, 359-384.

Michaeli, D., Ficu, D., Mor, G., & Har Paz, H. (1984). Aging of the population of a city and its implications for hospital based services: The example of Tel Aviv-Yaffo. Public Health Reports, 99, 446-449.

Minaker, K.L., & Rowe, J.W. (1985). Health and disease among the oldest old: A clinical perspective. Milbank Memorial Fund Quarterly, 63, 324-349.

Moffatt, D.F. (1984). Canada develops national long-term care guidelines. Dimensions in Health Services, 61(2), 32.

Morrill, R.L., & Earickson, R. (1968). Variation in the character and use of Chicago area hospitals. Health Services Research, 3, 224-238.

Murphy, F.W. (1977). Blocked beds. British Medical Journal, 1, 1395-96.

O'Neill, B., Zador, P., & Baker, S.P. (1979). Indexes of severity: Underlying concepts - A reply. Health Services Research, 14, 68-76.

Patterson, C., Crescenzi, C., & Steel, K. (1984). Hospital use by the extremely elderly (nonagenarians): A two year study. Journal of the American Geriatrics Society. 32, 350-352.

Pekarna, D.D., McWilliams, D.R., McLaughlin, D.B., & Appel, G.L. (1982). Population and diagnosis-based model projects bed needs. Hospital Progress, 63(1), 52-55.

Phillip, P.J., & Iyer, R.N. (1975). Classification of community hospitals. Health Services Research, 10, 349-368.

Posner, J.D., Gorman, K.M., & Woldow, A. (1984). Stroke in the elderly: 1. Epidemiology. Journal of the American Geriatrics Society, 32, 95-102.

Restuccia, J.D., & Halloway, D.C. (1976). Barriers to appropriate utilization of an acute facility. Medical Care, 14, 559-573.

Rice, D.P., & Feldman, J.J. (1983). Living longer in the United States: Demographic changes and health needs of the elderly. Milbank Memorial Fund Quarterly, 61, 363-396.

Roemer, M.I. (1961). Bed supply and hospital utilization: A natural experiment. Hospitals, 35(November), 36-42.

Romeril, C. (1984). Utilization of Pediatric Services in Alberta. Unpublished Master's Thesis. Department of Health Services Administration and Community Medicine, University of Alberta.

Roos, L.L., Roos, N.P., Cageorge, S.M., & Nicol, J.P. (1982). Medical Care, 20, 266-276.

Roos, N.P., Shapiro, E., & Roos, L.L. (1984). Aging and the demand for health services: Which aged and whose demand? The Gerontologist, 24, 31-35.

Rosenfeld, L.S., Goldman, F., & Kapiro, L. (1957). Reasons for prolonged hospital stay. Journal of Chronic Diseases, 6, 141-52.

Rubenstein, L.Z., Josephson, K.R., Wieland, G.D., & Kane, R.L. (1986). Differential prognosis and utilization patterns among clinical subgroups of hospitalized geriatric patients. Health Services Research, 20, 881-95.

Salter, J.C. (1982). In-depth prognosis avoids bed-blocking. Dimensions in Health Services, 59(11), 22-23.

Shachtman, R. H., Snapinn, S. M., Quade, D., Freund, D. A., & Kronhaus, A. K. (1986). A method for constructing case-mix indexes, with application to hospital length of stay. Health Services Research, 20, 737-762.

Shanas, Ethel (1984). Comparative socio-medical studies of the elderly. American Journal of Public Health, 74, 1196-1197.

Shapiro, E. (1983). Impending death and the use of hospitals by the elderly. Journal of the American Geriatrics Society, 31, 348-351.

Shapiro, E., & Roos, N.P. (1981). The geriatric long-stay hospital patient: A Canadian care study. Journal of Health Politics,Policy and Law,, 6, 49-61.

Shapiro, E., & Roos, L.L. (1984). Using health care: Rural/urban differences among the Manitoba elderly. The Gerontologist, 24, 270-274.

Shapiro, E., Roos, N.P., & Kavangh, S. (1980). Long-term patients in acute care beds: Is there a cure? The Gerontologist, 20, 342-349.

Shine, M.S. (1983). Discharge planning for the elderly patient in the acute care setting. Nursing Clinics of North America, 18, 403-410.

Shortell, S.M. (1980). Factors associated with the utilization of health services. In S.J. Williams & P.R. Torrens (Eds.), Introduction to Health Services (pp. 48-90). New York: John Wiley & Sons.

Siegler, M. (1984). Should age be a criterion in health care? Hastings Centre Report, 14(5), 24-27.

Soldo, B.J., & Manton, K.G. (1985). Changes in the health status and service needs of the oldest old: Current patterns and future trends. Milbank Memorial Fund Quarterly, 63, 286-319.

Somers, A. (1980). Rethinking health policy for the elderly: A six-point program. Inquiry, 17(Spring), 3-17.

Statistics Canada. Hospital Morbidity 1981 (Catalogue 82-206). Ottawa: Author, 1984b.

Steel, K. (1984). Iatrogenic disease on a medical service. Journal of the American Geriatrics Society, 32, 445-449.

Szafran, O. (1985). Utilization of Acute Care Hospitals by the Elderly in Alberta. Unpublished Master's Thesis. Department of Health Services Administration and Community Medicine, University of Alberta.

Teasdale, T.A., Shuman, L., Snow, E., & Luchi, R.J. (1983). A comparision of placement outcomes of geriatric cohorts receiving care in a geriatric assessment unit and on general medicine floors. Journal of the American Geriatrics Society, 31, 529-534.

Tedesco, J. (1985). Elderly require shift in hospital resources. Hospitals, 59(12), FB 53,-58,-63.

Thompson, J.D., Fetter, R.B., & Mross, C.D. (1975). Case mix and resource use. Inquiry, 12, 300-312.

Van der Gaage, J., Rutten, F., & Van Praag, B. (1975). Determinants of hospital utilization in the Netherlands. Health Services Research, 10, 264-277.

Verbrugge, L.M. (1984). Longer life but worsening health? Trends in health and mortality of middle aged and older persons. Milbank Memorial Fund Quarterly, 62, 475-519.

Victor, C.R., & Vetter, N.J. (1985). Use of community services by the elderly 3 and 12 months after discharge from hospital. International Rehabilitation Medicine, 7,

56-59.

Wachtel, T.J., Derby, C., & Fulton, J.P. (1984). Predicting the outcome of hospitalization for elderly persons: Home versus nursing home. Southern Medical Journal, 77, 1283-1285, 1290.

Williams, T.F., Hill, J.G., Fairbank, M.E., & Knox, K.G. (1973). Appropriate placement of the chronically ill and aged. The Journal of the American Medical Association, 226, 1332-1335.

World Health Organization. (1977) Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death. Geneva: Author.

Yin, P., & Shine, M. (1985). Misinterpretations of increases in life expectancy in gerontology textbooks. The Gerontologist, 25, 78-81.

Young, W.W., Swinkola. R.B., & Zorn, D.M. (1982). The measurement of hospital case mix. Medical Care, 20, 501-512.

APPENDIX A

TABLE A.1

SECONDARY DIAGNOSES ASSOCIATED WITH PRIMARY CIRCULATORY DIAGNOSES

	SEPS	%	PDAYS	%	ALOS	RALOS	S.D.
Primary Diagnosis Circulatory System	16407	100.0	210210	100.0	12.8	105.5	15.2
Secondary Diagnoses:							
Circulatory System	7589	46.3	95923	45.6	12.6	104.0	14.0
Endo, Nutri, & Metabolic Systems	1053	6.4	13178	6.3	12.5	103.0	13.4
Respiratory System	938	5.7	12700	6.0	13.5	111.4	14.6
Symptoms & Ill-Defined Conditions	753	4.6	10489	5.0	13.9	114.7	19.1
Nervous & Sense Organs	550	3.4	12686	6.0	23.1	189.8	26.1
Musculoskeletal System	472	2.9	5873	2.8	12.4	102.4	14.8
Digestive System	432	2.6	5649	2.7	13.1	107.6	15.3
Mental Disorders	367	2.2	5198	2.5	14.2	116.6	16.2
Genitourinary System	359	2.2	6281	3.0	17.5	144.0	19.9
Injury & Poisonings	305	1.9	5470	2.6	17.9	147.6	19.3
Supplementary Class Health Symptoms	261	1.6	2718	1.3	10.4	85.7	13.2
Neoplasms	206	1.3	3184	1.5	15.5	127.2	16.2
Blood & Blood Forming Organs	141	0.9	2287	1.1	16.2	133.5	18.5
Skin & Subcutaneous Tissue	112	0.7	1925	0.9	17.2	141.5	18.3
Other Secondary Diagnoses	85	0.5	1995	0.9	23.5	193.2	25.1
Without Secondary Diagnosis	2784	17.0	24654	11.7	8.9	72.9	10.9

Primary circulatory diagnoses represent 22.1 and 23.4 percent of the total elderly SEPS and PDAYS respectively.

TABLE A.2

SECONDARY DIAGNOSES ASSOCIATED WITH PRIMARY DIGESTIVE DIAGNOSES

	SEPS	%	PDAYS	%	ALOS	RALOS	S.D.
Primary Diagnosis Digestive System	9413	100.0	97880	100.0	10.4	85.6	11.4
Secondary Diagnoses:							
Digestive System	2227	23.7	29106	29.7	13.1	107.6	13.0
Circulatory System	1200	12.7	11325	11.6	9.4	77.7	10.3
Endocrine, Nutri., & Metabolic System	588	6.2	5939	6.1	10.1	83.1	11.1
Respiratory System	384	4.1	4416	4.5	11.5	94.7	12.4
Musculoskeletal System	358	3.8	3656	3.7	10.2	84.1	10.1
Genitourinary System	333	3.5	4525	4.6	13.6	111.8	14.5
Neoplasms	329	3.5	4101	4.2	12.5	102.6	12.0
Symptoms & Ill-Defined Conditions	321	3.4	3437	3.5	10.7	88.1	12.8
Mental Disorders	282	3.0	3790	3.9	13.4	110.6	15.6
Supplementary Class Health Syptoms	260	2.8	1974	2.0	7.6	62.5	8.6
Injuries & Poisonings	225	2.4	4033	4.1	17.9	147.5	15.8
Blood & B-Forming Organs	170	1.8	2007	2.1	11.8	97.2	11.6
Nervous & Sense Organs	162	1.7	1878	1.9	11.6	95.4	13.8
Other Secondary Diagnoses	148	1.6	1690	1.7	11.4	94.0	10.0
Without Secondary Diagnosis	2426	25.8	16003	16.3	6.6	54.3	6.0

Primary digestive diagnoses represent 12.7 and 10.9 percent of the total elderly SEPS and PDAYS respectively.

TABLE A.3

SECONDARY DIAGNOSES ASSOICATED WITH PRIMARY RESPIRATORY DIAGNOSES

	SEPS	%	PDAYS	%	ALOS	RALOS	S.D.
Primary Diagnosis Respiratory System	8051	100.0	91368	100.0	11.3	93.4	12.1
Secondary Diagnoses							
Respiratory System	1867	23.2	21644	23.7	11.6	95.4	11.9
Circulatory System	1667	20.7	20736	22.7	12.4	102.4	12.9
Endo, Nutri, & Metabolic Systems	440	5.5	5044	5.5	11.5	94.4	12.1
Symptoms & Ill-Defined Conditions	347	4.3	4023	4.4	11.6	95.4	13.0
Musculoskeletal System	325	4.0	3783	4.1	11.6	95.8	10.7
Digestive System	286	3.6	3384	3.7	11.8	97.4	10.8
Mental Disorders	277	3.4	3538	3.9	12.8	105.1	15.6
Genitourinary System	213	2.6	2962	3.2	13.9	114.5	15.8
Neoplasms	200	2.5	3121	3.4	15.6	128.4	18.6
Infectious & Parasitic Diseases	191	2.4	2303	2.5	12.1	99.2	10.6
Nervous & Sense Organs	182	2.3	2358	2.6	13.0	106.6	15.1
Supplementary Class Health Symptoms	112	1.4	973	1.1	8.7	71.5	8.7
Other Secondary Diagnoses	236	2.9	3241	3.5	13.7	113.0	13.7
Without Secondary Diagnosis	1708	21.2	14258	15.6	8.3	68.7	7.9

Primary respiratory diagnoses represent 10.9 and 10.1 percent of the total elderly SEPS and PDAYS respectively.

TABLE A.4

SECONDARY DIAGNOSES ASSOICATED WITH PRIMARY DIAGNOSES OF NEOPLASMS

	SEPS	%	PDAYS	%	ALOS	RALOS	S.D.
Primary Diagnosis of Neoplasms	7019	100.0	113305	100.0	16.1	132.9	16.9
Secondary Diagnoses:							
Neoplasms	2369	33.8	44206	39.0	18.7	153.6	18.1
Circulatory System	508	7.2	7675	6.8	15.1	124.4	17.0
Supplementary Class Health Symptoms	485	6.9	7337	6.5	15.1	124.5	16.8
Genitourinary System	450	6.4	6422	5.7	14.3	117.5	13.5
Respiratory System	358	5.1	6522	5.8	18.2	149.9	17.4
Digestive System	314	4.5	5878	5.2	18.7	154.1	16.1
Endo, Nutri, & Metabolic Systems	241	3.4	3680	3.2	15.3	125.7	15.2
Injuries & Poisonings	170	2.4	4734	4.2	27.8	229.2	22.6
Symptoms & Ill-Defined Conditions	167	2.4	2631	2.3	15.8	129.7	16.6
Blood & B Forming Organs	160	2.3	2316	2.0	14.5	119.1	14.1
Musculoskeletal System	116	1.7	1938	1.7	16.7	137.5	19.3
Nervous & Sense Organs	104	1.5	2022	1.8	19.4	160.0	19.6
Other Secondary Diagnoses	156	2.2	2631	2.3	16.9	138.8	18.9
Without Secondary Diagnosis	1421	20.2	15313	13.5	10.8	88.7	12.6

Primary neoplastic diagnoses represent 9.5 and 12.6 percent of the total elderly SEPS and PDAYS respectively.

TABLE A.5

SECONDARY DIAGNOSES ASSOCIATED WITH PRIMARY DIAGNOSES OF INJURY AND POISONINGS

	SEPS	%	PDAYS	%	ALOS	RALOS	S.D.
Primary Diagnosis of Injury & Poisoning	5411	100.0	79843	100.0	14.8	121.4	17.5
Secondary Diagnoses:							
Injuries & Poisonings	1116	20.6	19242	24.1	17.2	141.9	20.2
Circulatory System	745	13.8	11642	14.6	15.6	128.6	17.6
Musculoskeletal System	362	6.7	5963	7.5	16.5	135.6	16.8
Endocrine, Nutri., & Metabolic System	267	4.9	4072	5.1	15.3	125.5	17.2
Mental Disorders	223	4.1	3841	4.8	17.2	141.8	20.7
Respiratory System	218	4.0	3617	4.5	16.6	136.6	17.8
Nervous & Sense Organs	213	3.9	3433	4.3	16.1	132.7	19.7
Genitourinary System	180	3.3	3324	4.2	18.5	152.0	21.4
Digestive System	175	3.2	2936	3.7	16.8	138.1	16.9
Symptoms & Ill-Defined Conditions	161	3.0	2023	2.5	12.6	103.4	16.4
Supplementary Class Health Symptoms	138	2.6	2023	2.5	14.7	120.7	19.5
Other Secondary Diagnoses	274	5.1	5297	6.6	19.3	159.1	18.5
Without Secondary Diagnosis	1339	24.7	12430	15.6	9.3	76.4	11.2

Primary injury and poisoning diagnoses represent 7.3 and 8.9 percent of the total elderly SEPS and PDAYS respectively.

TABLE A.6

SECONDARY DIAGNOSES ASSOICATED WITH PRIMARY GENITOURINARY DIAGNOSES

	SEPS	%	PDAYS	%	ALOS	RALOS	S.D.
Primary Diagnosis Genitourinary System	5331	100.0	50535	100.0	9.5	78.0	9.6
Secondary Diagnoses:							
Genitourinary System	1552	29.1	15867	31.4	10.2	84.1	10.3
Circulatory System	536	10.1	5580	11.0	10.4	85.7	11.8
Symptoms & Ill-Defined Conditions	282	5.3	2926	5.8	10.4	85.4	9.4
Endo, Nutri, & Metabolic Systems	238	4.5	2295	4.5	9.6	79.4	8.5
Infectious & Parasitic Diseases	210	3.9	2232	4.4	10.6	87.5	10.5
Respiratory System	199	3.7	2192	4.3	11.0	90.7	12.0
Neoplasms	186	3.5	1714	3.4	9.2	75.8	7.6
Digestive System	173	3.2	1935	3.8	11.2	92.1	8.3
Supplementary Class Health Symptoms	166	3.1	1179	2.3	7.1	58.5	7.2
Musculoskeletal System	134	2.5	1294	2.6	9.7	79.5	7.9
Injury & Poisonings	121	2.3	1996	3.9	16.5	135.8	13.6
Other Secondary Diagnoses	255	4.8	3020	6.0	11.8	97.5	12.9
Without Secondary Diagnosis	1279	24.0	8305	16.4	6.5	53.4	4.9

Primary genitourinary diagnoses represent 7.2 and 5.6 percent of the total elderly SEPS and PDAYS respectively.

TABLE A.7

SECONDARY DIAGNOSES ASSOICATED WITH PRIMARY DIAGNOSES OF THE NERVOUS AND SENSE ORGANS

	SEPS	%	PDAYS	%	ALOS	RALOS	S.D.
Primary Diagnosis of Nervous & Sense Organs	4688	100.0	35733	100.0	7.6	62.7	9.8
Secondary Diagnoses:							
Circulatory System	754	16.1	5668	15.9	7.5	61.9	8.9
Nervous & Sense Organs	685	14.6	4952	13.9	7.2	59.5	8.0
Endo, Nutri, & Metabolic Systems	348	7.4	2693	7.5	7.7	63.7	9.1
Supplementary Class Health Symptoms	218	4.7	1245	3.5	5.7	47.0	8.9
Respiratory System	175	3.7	1452	4.1	8.3	68.3	9.6
Musculoskeletal System	160	3.4	1820	5.1	11.4	93.6	15.6
Mental Disorders	151	3.2	2541	7.1	16.8	138.5	18.9
Injuries & Poisonings	145	3.1	1162	3.3	8.0	66.0	9.0
Other Secondary Diagnoses	388	8.3	4852	13.6	12.5	102.9	14.6
Without Secondary Diagnosis	1664	35.5	9348	26.2	5.6	46.2	6.4

Primary nervous and sense organ diagnoses represent 6.3 and 4.0 percent of the total elderly SEPS and PDAYS respectively.

TABLE A.8

SECONDARY DIAGNOSES ASSOICATED WITH PRIMARY MUSCULOSKELETAL DIAGNOSES

	SEPS	%	PDAYS	%	ALOS	RALOS	S.D.
Primary Diagnosis Musculoskeletal System	4430	100.0	57438	100.0	13.0	106.7	12.8
Secondary Diagnoses:							
Musculoskeletal System	1064	24.0	14962	26.0	14.1	115.7	14.1
Circulatory System	572	12.9	7853	13.7	13.7	113.0	11.6
Endocrine, Nutri., & Metabolic System	261	5.9	3565	6.2	13.7	112.4	12.2
Respiratory System	186	4.2	2610	4.5	14.0	115.5	15.1
Supplementary Class Health Symptoms	137	3.1	1604	2.8	11.7	96.4	10.3
Digestive System	135	3.0	2143	3.7	15.9	130.7	16.7
Mental Disorders	129	2.9	1664	2.9	12.9	106.2	10.3
Injuries & Poisonings	125	2.8	2312	4.0	18.5	152.2	14.6
Nervous & Sense Organs	122	2.8	1812	3.2	14.9	122.2	14.3
Genitourinary System	114	2.6	1913	3.3	16.8	138.1	17.2
Symptoms & Ill-Defined Conditions	114	2.6	1488	2.6	13.1	107.4	14.4
Other Secondary Diagnoses	237	5.3	3741	6.5	15.8	129.9	16.0
Without Secondary Diagnosis	1234	27.9	11771	20.5	9.5	78.5	8.9

Primary musculoskeletal diagnoses represent 6.0 and 6.4 percent of the total elderly SEPS and PDAYS respectively.

APPENDIX B

TABLE B.1

PRIMARY SURGICAL PROCEDURES ASSOICATED WITH PRIMARY CIRCULATORY DIAGNOSES

	SEPS	%	PDAYS	%	ALOS	RALOS	S.D.
Primary Diagnosis Circulatory System	16407	100.0	210210	100.0	12.8	105.5	15.2
Primary Surgical Procedures:							
Miscellaneous Diagnostic T. & P.	7734	47.1	105769	50.3	13.7	112.6	15.9
Cardiovascular System	1850	11.3	26341	12.5	14.2	117.2	15.3
Digestive System	355	2.2	5561	2.6	15.7	128.9	16.0
Urinary System	309	1.9	6444	3.1	20.9	171.6	21.5
Musculoskeletal System	120	0.7	3546	1.7	29.6	243.2	26.1
Other Primary Surgical Procedures	423	2.6	10212	4.9	24.1	198.7	21.4
Without Primary Surgical Procedure	5616	34.2	52337	24.9	9.3	76.7	11.1

Primary circulatory diagnoses represent 22.1 and 23.4 percent of the total elderly SEPS and PDAYS respectively.

TABLE B.2

PRIMARY SURGICAL PROCEDURES ASSOICATED WITH PRIMARY DIGESTIVE DIAGNOSES

	SEPS	%	PDAYS	%	ALOS	RALOS	S.D.
Primary Diagnosis Digestive System	9413	100.0	97880	100.0	10.4	85.6	11.4
Primary Surgical Procedures:							
Digestive System	4302	45.7	55241	56.4	12.8	105.7	12.0
Miscellaneous Diagnostic T. & P.	2976	31.6	26909	27.5	9.0	74.4	10.4
Nose, Mouth & Pharynx	190	2.0	979	1.0	5.2	42.4	9.9
Other Primary Surgical Procedures	211	2.2	3838	3.9	18.2	149.7	20.4
Without Primary Surgical Procedure	1734	18.4	10913	11.1	6.3	51.8	7.1

Primary digestive diagnoses represent 12.7 and 10.9 percent of the total elderly SEPS and PDAYS respectively.

TABLE B.3

PRIMARY SURGICAL PROCEDURES ASSOICATED WITH PRIMARY RESPIRATORY DIAGNOSES

	SEPS	%	PDAYS	%	ALOS	RALOS	S.D.
Primary Diagnosis Respiratory System	8051	100.0	91368	100.0	11.3	93.4	12.1
Primary Surgical Procedures:							
Miscellaneous Diagnostic T. & P.	4629	57.5	53141	58.2	11.5	94.5	11.5
Respiratory System	338	4.2	5739	6.3	17.0	139.8	16.2
Nose, Mouth & Pharynx	183	2.3	710	0.8	3.9	31.9	4.3
Urinary System	115	1.4	1822	2.0	15.8	130.4	15.7
Other Primary Surgical Procedures	257	3.2	5557	6.1	21.6	178.0	19.0
Without Primary Surgical Procedure	2529	31.4	24399	26.7	9.6	79.4	10.6

Primary respiratory diagnoses represent 10.9 and 10.1 percent of the total elderly SEPS and PDAYS respectively.

TABLE B.4

PRIMARY SURGICAL PROCEDURES ASSOICATED WITH PRIMARY DIAGNOSES OF NEOPLASMS

	SEPS	%	PDAYS	%	ALOS	RALOS	S.D.
Primary Diagnosis Neoplasms	7019	112.6	113305	100.0	16.1	132.9	16.9
Primary Surgical Procedures:							
Miscellaneous Diagnostic T. & P.	1881	26.8	30070	26.5	16.0	131.6	17.5
Digestive System	1174	16.7	26613	23.5	22.7	186.6	17.7
Urinary System	702	10.0	8939	7.9	12.7	104.8	15.6
Male Genital Organs	570	8.1	7954	7.0	14.0	114.9	10.3
Respiratory System	479	6.8	9292	8.2	19.4	159.7	18.2
Integumentary System	456	6.5	4865	4.3	10.7	87.8	11.1
Female Genital Organs	238	3.4	2992	2.6	12.6	103.5	13.2
Hemic & Lymphatic Systems	228	3.2	4061	3.6	17.8	146.6	16.3
Nose, Mouth & Pharynx	146	2.1	1134	1.0	7.8	63.9	9.4
Other Primary Surgical Procedures	277	3.9	6060	5.3	21.9	180.1	22.7
Without Primary Surgical Procedure	868	12.4	11325	10.0	13.0	107.4	16.7

Primary diagnoses of neoplasms represent 9.5 and 12.6 percent of the total elderly SEPS and PDAYS respectively.

TABLE B.5

PRIMARY SURGICAL PROCEDURES ASSOICATED WITH PRIMARY DIAGNOSES OF INJURY AND POISONINGS

	SEPS	%	PDAYS	%	ALOS	RALOS	S.D.
Primary Diagnosis Injury & Poisoning	5411	100.0	79843	100.0	14.8	121.4	17.5
Primary Surgical Procedures:							
Miscellaneous Diagnostic T. & P.	1927	35.6	26145	32.7	13.6	111.7	15.9
Musculoskeletal System	1635	30.2	33521	42.0	20.5	168.7	21.0
Cardiovascular System	218	4.0	2816	3.5	12.9	106.3	15.3
Integumentary System	213	3.9	2910	3.6	13.7	112.4	16.0
Digestive System	155	2.9	2375	3.0	15.3	126.1	16.0
Urinary System	104	1.9	1754	2.2	16.9	138.8	22.3
Eye	100	1.8	540	0.7	5.4	44.4	6.1
Other Primary Surgical Procedures	159	2.9	2684	3.4	16.9	138.9	20.3
Without Primary Surgical Procedure	900	16.6	7098	8.9	7.9	64.9	9.2

Primary injury and poisonings diagnoses represent 7.3 and 8.9 percent of the total elderly SEPS and PDAYS respectively.

TABLE B.6

PRIMARY SURGICAL PROCEDURES ASSOICATED WITH PRIMARY GENITOURINARY DIAGNOSES

	SEPS	%	PDAYS	%	ALOS	RALOS	S.D.
Primary Diagnosis Genitourinary System	5331	100.0	50535	100.0	9.5	78.0	9.6
Primary Surgical Procedures:							
Male Genital Organs	1632	30.6	18061	35.7	11.1	91.1	8.1
Urinary System	1171	22.0	10410	20.6	8.9	73.2	10.1
Miscellaneous Diagnostic T. & P.	1166	21.9	10462	20.7	9.0	73.9	10.8
Female Genital Organs	622	11.7	4853	9.6	7.8	64.2	6.2
Integumentary System	118	2.2	573	1.1	4.9	40.0	9.1
Other Primary Surgical Procedures	107	2.0	2131	4.2	19.9	163.9	18.6
Without Primary Surgical Procedure	515	9.7	4045	8.0	7.9	64.6	9.6

Primary genitourinary diagnoses represent 7.2 and 5.6 percent of the total elderly SEPS and PDAYS respectively.

TABLE B.7

PRIMARY SURGICAL PROCEDURES ASSOCIATED WITH PRIMARY DIAGNOSES OF THE NERVOUS AND SENSE ORGANS

	SEPS	%	PDAYS	%	ALOS	RALOS	S.D.
Primary Diagnosis Nervous & Sense Organs	4688	100.0	35733	100.0	7.6	62.7	9.8
Primary Surgical Procedures:							
Eye	2866	61.1	15580	43.6	5.4	44.7	4.1
Miscellaneous Diagnostic T. & P.	678	14.5	9554	26.7	14.1	116.0	16.2
Nervous System	258	5.5	1486	4.2	5.8	47.4	7.9
Other Primary Surgical Procedures	198	4.2	3043	8.5	15.4	126.5	18.7
Without Primary Surgical Procedure	688	14.7	6070	17.0	8.8	72.6	11.1

Primary nervous and sense organ diagnoses represent 6.3 and 4.0 percent of the total elderly SEPS and PDAYS respectively.

TABLE B.8

PRIMARY SURGICAL PROCEDURES ASSOCIATED WITH PRIMARY MUSCULOSKELETAL DIAGNOSES

	SEPS	%	PDAYS	%	ALOS	RALOS	S.D.
Primary Diagnosis Musculoskeletal System	4430	100.0	57438	100.0	13.0	106.7	12.8
Primary Surgical Procedures:							
Miscellaneous Diagnostic T. & P.	2014	45.5	25380	44.2	12.6	103.7	13.1
Musculoskeletal System	1466	33.1	20415	35.5	13.9	114.6	12.6
Other Primary Surgical Procedures	271	6.1	5395	9.4	19.9	163.9	16.1
Without Primary Surgical Procedure	679	15.3	6248	10.9	9.2	75.7	9.1

Primary musculoskeletal diagnoses represent 6.0 and 6.4 percent of the total elderly SEPS and PDAYS respectively.

APPENDIX C

TABLE C.1

DIAGNOSTIC COMPLEXITY MEASURES
FOR PRIMARY CIRCULATORY DIAGNOSES
COMBINED WITH SECONDARY DIAGNOSES

SECONDARY DIAGNOSES	DIAGNOSTIC COMPLEXITY MEASURES
Without Secondary Diagnoses	1.00
Neoplasms	1.75
Endo., Nutri. & Metabolic System	1.41
Blood & Blood Forming Organs	1.83
Mental Disorders	1.60
Nervous & Sense Organs	2.60
Circulatory System	1.43
Respiratory System	1.53
Digestive System	1.48
Genitourinary System	1.98
Skin & Subcutaneous Tissue	1.94
Musculoskeletal System	1.41
Symptoms & Ill-Defined Conditions	1.57
Injury & Poisonings	2.03
Supplementary Class Conditions	1.18
Other Secondary Diagnoses	2.65

NB: DCM = RALOS/STANDARD RALOS

TABLE C.2

DIAGNOSTIC COMPLEXITY MEASURES
FOR PRIMARY DIGESTIVE DIAGNOSES
COMBINED WITH SECONDARY DIAGNOSES

SECONDARY DIAGNOSES	DIAGNOSTIC COMPLEXITY MEASURES
Without Secondary Diagnoses	0.74
Digestive System	1.48
Circulatory System	1.07
Endocrine, Nutri, & Metabolic	1.14
Respiratory System	1.30
Musculoskeletal System	1.15
Genitourinary System	1.53
Neoplasms	1.41
Symps & Ill-Defined Conditions	1.21
Mental Disorders	1.52
Supp Class Health Symptoms	0.86
Injury & Poisoning	2.02
Blood & Blood Forming Organs	1.33
Nervous & Sense Organs	1.31
Other Secondary Diagnoses	1.29

NB: DCM = RALOS/STANDARD RALOS

TABLE C.3

DIAGNOSTIC COMPLEXITY MEASURES
FOR PRIMARY RESPIRATORY DIAGNOSES
COMBINED WITH SECONDARY DIAGNOSES

SECONDARY DIAGNOSES	DIAGNOSTIC COMPLEXITY MEASURES
Without Secondary Diagnoses	0.94
Respiratory System	1.31
Circulatory System	1.40
Endo, Nutri, & Metabolic	1.29
Symps & Ill-Defined Conditions	1.31
Musculoskeletal System	1.31
Digestive System	1.34
Mental Disorders	1.44
Genitourinary System	1.57
Neoplasms	1.76
Infectious & Parasitic Disease	1.36
Nervous & Sense Organs	1.46
Supp Class Health Symptoms	0.98
Other Secondary Diagnoses	1.55

NB: DCM = RALOS/STANDARD RALOS

TABLE C.4

DIAGNOSTIC COMPLEXITY MEASURES
FOR PRIMARY NEOPLASTIC DIAGNOSES
COMBINED WITH SECONDARY DIAGNOSES

SECONDARY DIAGNOSES	DIAGNOSTIC COMPLEXITY MEASURES
Without Secondary Diagnoses	1.22
Neoplasms	2.11
Circulatory System	1.71
Supp Class Health Symptoms	1.71
Genitourinary System	1.61
Respiratory System	2.06
Digestive System	2.11
Endocrine, Nutri, & Metabolic	1.72
Injury & Poisoning	3.14
Symps & Ill-Defined Conditions	1.78
Blood & Blood Forming Organs	1.63
Musculoskeletal System	1.89
Nervous & Sense Organs	2.20
Other Secondary Diagnoses	1.90

NB: DCM = RALOS/STANDARD RALOS

TABLE C.5

DIAGNOSTIC COMPLEXITY MEASURES FOR PRIMARY INJURY AND POISONINGS DIAGNOSES COMBINED WITH SECONDARY DIAGNOSES

SECONDARY DIAGNOSES	DIAGNOSTIC COMPLEXITY MEASURES
Without Secondary Diagnoses	1.05
Injury & Poisoning	1.95
Circulatory System	1.76
Musculoskeletal System	1.86
Endocrine, Nutri, & Metabolic	1.72
Mental Disorders	1.94
Respiratory System	1.87
Nervous & Sense Organs	1.82
Genitourinary System	2.08
Digestive System	1.89
Symps & Ill-Defined Conditions	1.42
Supp Class Health Symptoms	1.66
Other Secondary Diagnoses	2.18

NB: DCM = RALOS/STANDARD RALOS

TABLE C.6

DIAGNOSTIC COMPLEXITY MEASURES
FOR PRIMARY GENITOURINARY DIAGNOSES
COMBINED WITH SECONDARY DIAGNOSES

SECONDARY DIAGNOSES	DIAGNOSTIC COMPLEXITY MEASURES
Without Secondary Diagnoses	0.73
Genitourinary System	1.15
Circulatory System	1.18
Symps & Ill-Defined Conditions	1.17
Endocrine, Nutri, & Metabolic	1.09
Infectious & Parasitic Dis	1.20
Respiratory System	1.24
Neoplasms	1.04
Digestive System	1.26
Supp Class Health Symptoms	0.80
Musculoskeletal System	1.09
Injury & Poisoning	1.86
Other Secondary Diagnoses	1.34

NB: DCM = RALOS/STANDARD RALOS

TABLE C.7

DIAGNOSTIC COMPLEXITY MEASURES FOR
PRIMARY NERVOUS AND SENSE ORGAN DIAGNOSES
COMBINED WITH SECONDARY DIAGNOSES

SECONDARY DIAGNOSES	DIAGNOSTIC COMPLEXITY MEASURES
Without Secondary Diagnoses	0.63
Circulatory System	0.85
Nervous & Sense Organs	0.82
Endocrine, Nutri, & Metabolic	0.87
Supp Class Health Symptoms	0.64
Respiratory System	0.94
Musculoskeletal System	1.28
Mental Disorders	1.90
Injury & Poisoning	0.90
Other Secondary Diagnoses	1.41

NB: DCM = RALOS/STANDARD RALOS

TABLE C.8

DIAGNOSTIC COMPLEXITY MEASURES FOR PRIMARY MUSCULOSKELETAL DIAGNOSES COMBINED WITH SECONDARY DIAGNOSES

SECONDARY DIAGNOSES	DIAGNOSTIC COMPLEXITY MEASURES
Without Secondary Diagnoses	1.08
Musculoskeletal System	1.59
Circulatory System	1.55
Endocrine, Nutri, & Metabolic	1.54
Respiratory System	1.58
Supp Class Health Symptoms	1.32
Digestive System	1.79
Mental Disorders	1.46
Injury & Poisoning	2.09
Nervous & Sense Organs	1.68
Symps & Ill-Defined Conditions	1.47
Genitourinary System	1.89
Other Secondary Diagnoses	1.78

NB: DCM = RALOS/STANDARD RALOS

APPENDIX D

TABLE D.1

DIAGNOSTIC COMPLEXITY MEASURES FOR PRIMARY CIRCULATORY DIAGNOSES COMBINED WITH PRIMARY SURGERIES

SURGICAL PROCEDURES	DIAGNOSTIC COMPLEXITY MEASURES
Without Surgical Procedures	1.00
Cardiovascular Operations	1.53
Digestive Operations	1.68
Urinary Operations	2.24
Musculoskeletal Operations	3.17
Miscellaneous Diagnostic T & P	1.47
Other Operations	2.59

NB: DCM = RALOS/STANDARD RALOS

TABLE D.2

DIAGNOSTIC COMPLEXITY MEASURES
FOR PRIMARY DIGESTIVE DIAGNOSES
COMBINED WITH PRIMARY SURGERIES

SURGICAL PROCEDURES	DIAGNOSTIC COMPLEXITY MEASURES
Without Operative Procedures	0.68
Opr Digestive System	1.38
Opr Misc Diagnostic T. & P.	0.97
Opr Nose, Mouth & Pharynx	0.55
Other Operative Procedures	1.95

NB: DCM = RALOS/STANDARD RALOS

TABLE D.3

DIAGNOSTIC COMPLEXITY MEASURES
FOR PRIMARY RESPIRATORY DIAGNOSES
COMBINED WITH PRIMARY SURGERIES

SURGICAL PROCEDURES	DIAGNOSTIC COMPLEXITY MEASURES
Without Operative Procedures	1.04
Opr Misc Diagnostic T. & P.	1.23
Opr Respiratory System	1.82
Opr Nose, Mouth & Pharynx	0.42
Opr Urinary System	1.70
Other Operative Procedures	2.32

NB: DCM = RALOS/STANDARD RALOS

TABLE D.4

DIAGNOSTIC COMPLEXITY MEASURES
FOR PRIMARY NEOPLASTIC DIAGNOSES
COMBINED WITH PRIMARY SURGERIES

SURGICAL PROCEDURES	DIAGNOSTIC COMPLEXITY MEASURES
Without Operative Procedures	1.40
Opr Misc Diagnostic T. & P.	1.72
Opr Digestive System	2.43
Opr Urinary System	1.37
Opr Male Genital Organs	1.50
Opr Respiratory System	2.08
Opr Integumentary System	1.14
Opr Female Genital Organs	1.35
Opr Hemic & Lymphatic System	1.91
Opr Nose, Mouth & Pharynx	0.83
Other Operative Procedures	2.35

NB: DCM = RALOS/STANDARD RALOS

TABLE D.5

DIAGNOSTIC COMPLEXITY MEASURES FOR PRIMARY INJURY AND POISONINGS DIAGNOSES COMBINED WITH PRIMARY SURGERIES

SURGICAL PROCEDURES	DIAGNOSTIC COMPLEXITY MEASURES
Without Operative Procedures	0.85
Opr Misc Diagnostic T. & P.	1.46
Opr Musculoskeletal	2.20
Opr Cardiovascular	1.39
Opr Integumentary System	1.47
Opr Digestive System	1.64
Opr Urinary System	1.81
Opr Eye	0.58
Other Operative Procedures	1.81

NB: DCM = RALOS/STANDARD RALOS

TABLE D.6

DIAGNOSTIC COMPLEXITY MEASURES
FOR PRIMARY GENITOURINARY DIAGNOSES
COMBINED WITH PRIMARY SURGERIES

SURGICAL PROCEDURES	DIAGNOSTIC COMPLEXITY MEASURES
Without Operative Procedures	0.84
Opr Male Genital Organs	1.19
Opr Urinary System	0.95
Opr Misc Diagnostic T. & P.	0.96
Opr Female Genital Organs	0.84
Opr Integumentary System	0.52
Other Operative Procedures	2.14

NB: DCM = RALOS/STANDARD RALOS

TABLE D.7

DIAGNOSTIC COMPLEXITY MEASURES FOR PRIMARY NERVOUS AND SENSE ORGAN DIAGNOSES COMBINED WITH PRIMARY SURGERIES

SURGICAL PROCEDURES	DIAGNOSTIC COMPLEXITY MEASURES
Without Operative Procedures	0.95
Opr Eye	0.58
Opr Misc Diagnostic T. & P.	1.51
Opr Nervous System	0.62
Other Operative Procedures	1.65

NB: DCM = RALOS/STANDARD RALOS

TABLE D.8

DIAGNOSTIC COMPLEXITY MEASURES FOR PRIMARY MUSCULOSKELETAL DIAGNOSES COMBINED WITH PRIMARY SURGERIES

SURGICAL PROCEDURES	DIAGNOSTIC COMPLEXITY MEASURES
Without Operative Procedures	0.99
Opr Misc Diagnostic T. & P.	1.35
Opr Musculoskeletal	1.49
Other Operative Procedures	2.14

NB: DCM = RALOS/STANDARD RALOS